Habitat Management Plan

V5 [10/9/15]

Panoche Valley Solar Project Conservation Lands

San Benito and Fresno Counties, California

Prepared for:

Panoche Valley Solar, LLC

Prepared by McCormick Biological, Inc.,
Burns & McDonnell Engineering Co. Inc.
and the Center for Natural Lands Management

McCORMICK BIOLOGICAL INC

Center for Natural Lands Management

[Inside cover]

Cover photographs:

Background photo: Silver Creek Ranch, December 2014 (©CNLM)

Counterclockwise from left:

San Joaquin antelope squirrel: CNLM Lokern Preserve, 2006 (©CNLM)

Atriplex polycarpa seedlings: Lokern Preserve, 2009 (©CNLM)

San Joaquin kit fox: Buena Vista Valley, 1990s (©G. Warrick)

Blunt-nosed leopard lizard: CNLM Lokern Preserve, 2006 (©CNLM)

Giant kangaroo rat: CNLM Lokern Preserve, 2006 (©CNLM)

TABLE OF CONTENTS

DEFINITIONS

Covered Species – Those animal species for which this Habitat Management Plan is designed to conserve and protect in perpetuity (i.e., no listed plant species were impacted by the Project).

Conservation Land Manager –The entity approved by the applicant, California Department of Fish and Wildlife and the US Fish and Wildlife Service that will implement the management actions described in the Habitat Management Plan on the Panoche Valley Solar Conservation Lands.

Conservation Lands – Three large parcels of land acquired to offset potential impacts as part of a conservation package consisting of the permanent preservation and management of those parcels (Valley Floor Conservation Lands, Valadeao Ranch Conservation Lands, and Silver Creek Ranch Conservation Lands).

Habitat Management Plan – The implementation document that defines specific actions that will be undertaken by the Conservation Land Manager to maintain and enhance habitat values for the Covered Species.

Project Footprint – The area including the solar arrays and associated roads and equipment, totaling 2,506 acres.

Restoration Biologist – Qualified entity or person to oversee restoration and enhancement implementation and fulfill short-term monitoring and reporting requirements.

Restoration Contractor – Qualified entity or person to implement and maintain restoration and enhancement actions.

ACRONYMS AND ABBREVIATIONS

ACEC	Areas of Critical Environmental Concern
AMSL	Above mean sea level
BA	Biological Assessment
BLM	Bureau of Land Management
BMP	Best management practices
BNLL	Blunt-nosed leopard lizard
BO	Biological Opinion
°C	(Degrees) Celsius
CACO	California condor
CalFire	California Department of Forestry and Fire Protection
CDFW	California Department of Fish and Wildlife
CESA	California Endangered Species Act
CFS	Conservancy Fairy Shrimp
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CTS	California tiger salamander
DEIR	Draft Environmental Impact Report
DNA	Deoxyribonucleic Acid
ESA	Endangered Species Act
FEIR	Final Environmental Impact Report

GKR	Giant kangaroo rat
HMP	Habitat Management Plan
HSM	Habitat suitability model
I-5	Interstate 5
ITP	Incidental Take Permit
km	Kilometer
kV	Kilovolt
LOA	Live Oak Associates, Inc.
LHFS	Longhorn Fairy Shrimp
m	Meter
mm	Millimeter
mph	Miles per hour
MW	Megawatt
PVS	Panoche Valley Solar
RDM	Residual Dry Matter
RWQCB	Regional Water Quality Control Board
SBCFD	San Benito County Fire Department
SCP	Scientific Collecting Permits
SCRCL	Silver Creek Ranch Conservation Lands
SJAS	San Joaquin antelope squirrel
SJKF	San Joaquin kit fox

USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VFCL	Valley Floor Conservation Lands
VPFS	Vernal Pool Fairy Shrimp
VPTS	Vernal Pool Tadpole Shrimp
VRCL	Valadeao Ranch Conservation Lands

1.0 Introduction

1.1 Background and Purpose

1.1.1 Proposed Project

Panoche Valley Solar, LLC (PVS or Applicant) proposes to construct and operate the Panoche Valley Solar Facility (PVS Facility, Project, or the Action), an approximately 247 megawatt (MW) solar photovoltaic (PV) energy generating facility located in San Benito County, California (Figure 1). The Project Footprint consists of approximately 2,506 acres in the Panoche Valley of eastern San Benito County, California (Figure 2). The Project includes construction and operation of the solar array complexes, an operations and maintenance (O&M) building, perimeter roads that allow for emergency access and egress, electricity collection lines, DC-AC inverters, an electrical substation and switchyard, Pacific Gas & Electric (PG&E) telecommunication upgrades, and decommissioning of the Project. Construction of the PVS Facility is anticipated to commence in 2015 and will be completed over an approximately 18-month period and Project close-out activities continuing for approximately 4-6 months following energization.

The Project proposed by PVS incorporates important general and species-specific conservation measures to avoid and minimize impacts on biological and other natural resources. The Project will implement a conservation package consisting of the permanent preservation of approximately 24,176 acres of high quality Conservation Lands that are contiguous with the Project Footprint (Figure 2). Those Conservation Lands, in conjunction with the enhancement and management activities outlined in this plan, will provide a net species benefit and fully offset potential impacts to special-status species occurring on the 1,794 acres of impacted lands within the Project Footprint. The Conservation Lands will preserve core populations of special status species and

permanently protect movement corridors to adjacent lands controlled by the U.S. Department of the Interior's Bureau of Land Management (BLM)[1].

1.1.2 Purpose of the Habitat Management Plan

The Valley Floor Conservation Lands (VFCL), Valadeao Ranch Conservation Lands (VRCL), and Silver Creek Ranch Conservation Lands (SCRCL) have been designated as compensatory mitigation for unavoidable impacts to federal- and state-listed species and associated habitat (Figure 2). The Habitat Management Plan (HMP) is intended to provide detailed guidance to the Restoration Contractor, Restoration Ecologist, Conservation Easement Holder, and Conservation Land Manager for implementing conservation measures on the approximately 24,176 acres of land held in the Conservation Easement(s). The HMP provides the conservation strategy elements and standards for protecting, maintaining, and enhancing Conservation Lands for federal and state-listed species and their associated habitats and defines the tasks and procedures to implement the conservation strategy. The HMP also provides an estimate of costs associated with this comprehensive stewardship program which will be carried out by the Conservation Land Management entity in perpetuity.

1.1.3 Legal and Regulatory Context

This HMP provides implementation methods that will meet the habitat mitigation and management requirements on the Conservation Lands as outlined in the Final and Supplemental Environmental Impact Reports (FEIR and SEIR, respectively). This plan will be in full effect when approved by the the Ventura Office of the U.S. Fish and Wildlife Service (USFWS) and the California Department of Fish and Wildlife (CDFW), Central Region (together, regulatory agencies).

[1] This amount of land far exceeds the amount of land required to satisfy the mitigation ratios contained in the San Benito County Conditional Use Permit and Final Supplement Environmental Impact Report, Notice of Decision Filed on May 20, 2015.

The HMP addresses the following mitigation measures from the FEIR (http://www.cosb.us/Solargen/feir.htm) and SEIR (http://cosb.us/panoche-valley-solar-farm-project/#.VO9gcmc5BD_):

- BR-1.2: Develop and implement a Grazing Plan for the Project
- BR-G.5: Create permanent easements as compensation for impacts to biological resources
- BR-G.6: Develop and implement a Habitat Mitigation and Monitoring Plan

The monitoring objectives, performance criteria, and implementation methods contained in this HMP are also intended to be consistent with requirements which will be detailed in the Biological Opinion (BO) issued by the USFWS, and pursuant to Section 7(c)(1) of the Endangered Species Act (ESA) of 1973 and the 2081 Incidental Take Permit (ITP) which will be issued by the CDFW pursuant to the California Endangered Species Act (CESA).

The BO and ITP are anticipated to require the preservation of approximately 24,176 acres of land in the VFCL, VRCL, and SCRCL. The HMP addresses conservation measures applicable to the Conservation Lands as proposed by the Applicant and the Reasonable and Prudent Measures anticipated to be listed in the BO by the USFWS (once the BO is issued, this plan will be updated to include any additional or changes to measures as needed). In addition, the HMP will include minimization and avoidance measures required on the Conservation Lands once the ITP has been issued by CDFW.

1.2 Roles and Responsibilities

PVS is the Project Applicant and responsible for implementing mitigation for the Project. Other roles related to mitigation for this Project include:

- Implementing initial activities including habitat creation, restoration, and enhancement, as well as biological monitoring;
- Holding a conservation easement over the Conservation Lands;

- Managing an endowment for Conservation Land stewardship and easement responsibilities; and
- Managing the Conservation Lands in perpetuity.

Implementation of habitat enhancement, restoration, and creation activities: These activities, as described in this HMP, may be contracted by the Project Applicant to qualified consultants (Restoration Contractor) or may be conducted directly by the Conservation Land Manager.

Biological monitoring during performance period: This role could be provided by the Conservation Land Manager entity or contracted to a qualified consultant (Restoration Biologist).

Conservation Easement role: The owner of the Conservation Lands will grant Conservation Easement(s) to a qualified entity to protect and maintain their natural open space condition in perpetuity. The grantee of the Conservation Easement(s) will be responsible in perpetuity for monitoring the Conservation Lands for compliance with terms of the Conservation Easement(s), defending and enforcing the Conservation Easement(s), and providing annual reports. USFWS, USACE, CDFW, the Central Coast Regional Water Quality Control Board (RWQCB), and San Benito County, are anticipated third-party beneficiaries (TPBs) of the Conservation Easement(s). It is anticipated that the Conservation Land Manager would also hold the Conservation Easement(s), given the compatibility in objectives of these roles and the efficiency in use of financial resources.

Conservation Land Manager role: The Center for Natural Lands Management (CNLM) or another qualified and approved third-party entity would conduct activities for this role. CNLM is approved by CDFW to hold and manage mitigation lands in California (CDFW 2015). Management activities include long-term biological monitoring (and potentially the biological monitoring during the performance period), protection (e.g., such as fencing), reporting, grazing management, and other appropriate stewardship activities to maintain the conservation functions and values of the Conservation Lands in perpetuity.

2.0 Description of Conservation Lands

2.1 Location and Setting

The Conservation Lands (Figures 1 and 2) are located in Panoche Valley, in the Counties of San Benito and Fresno, in the State of California, within the following sections of the Federal Townships:

Valley Floor Conservation Lands – San Benito County

- Sections 4, 8-10, 13-16, and 19 of Township 15 south, Range 10 east

Valadeao Ranch Conservation Lands – San Benito and Fresno Counties

- Sections 19, 30, and 31 of Township 14 south, Range 11 east;
- Sections 21-27 and 32-36 of Township 14 south, Range 10 east;
- Sections 1-8 and 10-14 of Township 15 south, Range 10 east; and
- Sections 6, 7, 19, and 20 of Township 15 south, Range 11 east.

Silver Creek Ranch Conservation Lands – San Benito and Fresno Counties

- Sections 20-21, 26-36 of Township 15 south, Range 11 east
- Sections 1-6, and 8-12 of Township 16 south, Range 11 east

The Conservation Lands, approximately 24,176 acres in total, include 2,514 acres of the VFCL adjacent to the Project Footprint (Figures 2 and 3); 10,772 acres of the VRCL located contiguous with the Project site (Figures 2 and 4); and 10,890 acres of the SCRCL located immediately to the southeast of the Project Footprint (Figures 2 and 5).

The Conservation Lands are surrounded by private cattle ranches and BLM-administered lands. BLM lands are extensive in the Ciervo-Panoche Natural Area surrounding the site. BLM lands almost completely surround the SCRCL to the south, east, and north, and the VFCL and VRCL to the east. Areas of Critical Environmental Concern (ACECs)—a BLM designation—are also extensive throughout this region.

2.2 General Site Characteristics

2.2.1 Watershed

The Panoche/Silver Creek Watershed is located upstream and west of Mendota, California, and is approximately 50 miles west of Fresno, California (Figure 1). The watershed area, as defined for this HMP, encompasses approximately 300 square miles upstream of Interstate-5 (I-5) and ranges in elevation from approximately 500 feet at I-5 to 5,000 feet near the upper watershed boundary. The Panoche/Silver Creek Watershed is located in Fresno and San Benito Counties and lies on the western edge of the San Joaquin Valley in the Diablo Range. Soils in the watershed are derived predominantly from marine sediments (sandstones and shales) of the Moreno, Kreyenhagen, and Panoche Formations, and Franciscan Assemblage (as stated in County of San Benito FEIR 2010). These soils support a sparse vegetative cover on most hillsides, with more vegetative cover generally associated with flatter valley floor areas and hillslopes at higher elevations. Large areas of unvegetated soils exist where the soil is thin, particularly on steep slopes and near stream channels. Areas of thin soil also occur over rock containing relatively high concentrations of selenium. Within the watershed upstream of I-5, approximately 30 percent of the land is managed by the BLM, primarily for green-season grazing (Figure 6). Other lands are privately held and used for rangeland grazing or irrigated cropland (just upstream of I-5). Downstream of I-5, lands are used primarily for agricultural crops.

2.2.2 Climate

The Conservation Lands occur in a Mediterranean climate with dry hot summers and cool wet winters. However, this region does not experience heavy rainfall. Annual precipitation in the general vicinity of the site ranges from eight to ten inches per year. Approximately 85 percent of precipitation falls between October and March. Temperatures average approximately 80 degrees Fahrenheit (˚F) in the summer and 40˚F in the winter, mid-summer temperatures are often over 100˚F, and winter lows can be close to freezing . Nearly all precipitation infiltrates into the site's soils and flows in creeks and drainages when soil capacity has been reached.

2.2.3 Biotic Habitats

Approximately 73% of the Conservation Land is composed of annual grassland habitat, followed by ephedra shrubland (21%), barrens (2.4%), and saltbush shrublands (2%). Other habitat types (juniper woodlands, oak woodlands, riparian, ponds, and vernal pools) each make up less than one percent of the land area (Table 1; Figures 3 through 5). Further details of vegetation communities can be found in Appendix B.

Table 1. Biotic Habitat Alliances on the Conservation Lands

Biotic Habitat Alliances	Valley Floor Conservation Lands (Acres)	Valadeao Ranch Conservation Lands (Acres)	Silver Creek Ranch Conservation Lands (Acres)	Total (Acres)
Annual Grassland	2,357	6,727	8,314	17,407
Ephedra Shrublands	--	2,705	2,259	4,964
Barrens	--	575	--	575
Saltbush Shrublands	--	476	--	476
Juniper Woodlands	--	68	--	68
Oak Woodlands	--	16	--	16
Wetlands and Associated Habitats	--	2.1	233	235.1
Mechanically Disturbed & Devegetated	--	3	--	3
Ponds	1.6	2.4	--	4.0
Vernal Pools	2.9	0.2	--	3.1
Wash/Drainage/ Stream	88	--	--	88
No data*	65	197	84	346
TOTAL	**2,514**	**10,772**	**10,890**	**24,176**

*No GIS data was available for these acreages.

2.2.4 Rare Plant Populations

No federal- or state-listed plant species were located during Project-level surveys conducted for the Project. In addition, no federal- or state-listed plant species were located during reconnaissance-level surveys of the VFCL, VRCL and SCRCL. Six non-listed rare or sensitive plant species were observed during the survey of plant associations on VFCL, VRCL, and SCRCL. Additional details are included in Appendix B.

2.2.5 Invasive Plant Species

Numerous invasive plants common to central and southern California are found on the Conservation Lands. Grasses such as red brome are dominant in the annual grasslands as well as being a component of the shrub communities in many other habitat types on the Conservation Lands. Other invasives, such as *Erodium cicutarium*, are commonly found but are not as disruptive to the historic natural landscape as invasive bromes because thatch buildup seldom occurs with this species.

Invasive plants can out-compete native species leading to decreased biological diversity in the habitat, extirpation of some natives, and lower quality foraging opportunities. Prevalence of invasives may also increase the risk of range fires which can further damage shrub habitats that recover slowly from fire effects. Many invasive plants also are early successional plants, giving them an advantage on disturbed habitats where remediation may be desirable.

2.2.6 Covered Species

Covered Species are those species which this HMP is designed to conserve and protect in perpetuity on the Conservation Lands. These species are considered extant, or have the potential to occur, on the Conservation Lands. Several studies have been completed to identify the suitable habitat for each species for each of the conservation areas (Table 2; Figures 7-11). The acreage required as mitigation in accordance with the FEIR and SEIR will be the focus for management and monitoring for specific Covered Species while preserving the entirety of the Conservation Lands for all Covered Species. Future non-preservation mitigation (e.g., additional enhancement, restoration, management, and

monitoring) activities on the Conservation Lands may be as part of future mitigation of other development Projects or by other organizations to continue the recovery of threatened and endangers species, vegetation communities or habitat. Upon coordination with the land owner and manager and with guidance and approval from CDFW, USFWS, USACE, and RWQCB; other entities may utilize the Conservation Lands as long as these efforts do not conflict with this HMP. Appendix B describes surveys that have been conducted to date that establish the presence and distribution of Covered Species on the Conservation Lands. Appendix C contains detailed species descriptions and Appendix D provides a summary of survey results.

Table 2 describes the mitigation required in the CEQA documents in relation to the actual acres preserved.

Table 2. Covered Species Requiring Mitigation Per CEQA

Species	Species Code	Listed Status		Permanent Impacts to Suitable Habitat (acres)	Mitigation Ratios (as per CEQA)	Mitigation Acres Required	Total Acres Preserved
		State	Federal				
San Joaquin Kit Fox	SJKF	Endangered	Threatened	1,794	4:1	7,176	14,863
Giant Kangaroo Rat	GKR	Endangered	Endangered	1,794	3:1	5,382	16,576
San Joaquin Antelope Squirrel	SJAS	None	Threatened	1,794	1:1	1,794	24,176[1]
California Tiger Salamander	CTS	Threatened	Threatened	NA	Various[3]	NA	4,028[2]

1. Entire Conservation Lands acreage is suitable foraging habitat for this species.
2. Suitable estivation habitat on VFCL and VRCL
3. CTS suitable breeding habitats and suitable upland habitat impacted within 2,100 feet of a known or potential breeding pond will be mitigated at a 3:1 acreage ratio, suitable upland habitat located between 2,100 feet and 2,640 feet (0.5 mile) of a breeding pond will be mitigated at a 2:1 acreage ratio, and suitable upland habitat located between 2,640 feet and 6,636 feet (1.2 miles) of a breeding pond will be mitigated at a 1:1 acreage ratio. Temporary impacts will be mitigated at a 0.5:1 acreage ratio. Preserved habitat shall be the same quality or better quality than the habitat disturbed.

2.2.7 Historical and Recent Land Use

The land in the general area of the Conservation Lands has been grazed for over 150 years. The earliest non-native settlers of the San Benito County mountain ranges, foothills, and valleys were Mexican citizens. In 1844, Mexican Governor Manuel Micheltorena granted a 22,000-acre tract of land in this region, but not in the Project Footprint or Conservation Lands, called "Panoche de San Juan y los Carrisalitos" to Julian Ursua and Pedro Romero . Panoche Valley has always been sparsely inhabited with very few buildings. Since the mid-1800s, the land has been used exclusively for cattle, sheep, and horse grazing and associated cultivation of forage crops (primarily alfalfa). According to evidence gleaned from historic maps and aerial photographs of the area from the twentieth century, early landowners established clusters of buildings and structures related to their ranching or farming operations. Each cluster (there were fewer than 10 in the valley) typically had a stand of trees, and may have included residences, barns, sheds, water tanks, wells, shelters, corrals, troughs, and related outbuildings. A number of these clusters of buildings and structures have been demolished over the years and, in some cases, replaced with new structures. Evidence suggests that few, if any, new clusters of buildings have been built since the early 1900s (JRP 2010).

2.2.8 Livestock Grazing/Agriculture

As stated above, cattle, sheep, and horse grazing has been the primary agricultural use and land use on the VFCL, VRCL, and SCRCL. Rotational grazing, which was subject to individual landowner/lessee management, has been the common practice. Ranchers and grazing operators have managed livestock grazing on these lands for decades, presumably profitably, and have accumulated consider grazing management experience. Although the Conservation Lands primarily have been used for cattle grazing for the past 100 years, portions of the VFCL have been used to grow crops. From the 1940s through early 1970s, various irrigated crops were grown on this land including cotton, watermelon, potatoes, turnips, cucumbers, sugar beets, and lettuce. At least some irrigated and dryland crop production extended into the 1990s (San Benito County 2010).

2.2.9 Fire

In rangeland areas such as those on the Conservation Lands, causes of wildland fire include equipment and vehicles, lightning strikes, and downed powerlines. Although documented fire history specific to the Conservation Lands is not available, it is likely that the lands have been subject to wildland fires on a fairly regular basis in some locations. There appears to have been a large fire on the VRCL within the last decade, as evidenced by the presence of numerous burned ephedra (*Ephedra* sp.) stumps. Maintenance of a disked fire break along public roads has been implemented as a fire prevention measure. Other than San Benito County ordinances and California Department of Forestry and Fire Protection (CalFire) guidelines, no formal fire prevention or management plan exists for the Conservation Lands.

The primary biotic habitats and ecosystems of the Conservation Lands habitats and ecosystems are somewhat resilient to infrequent fires, but changes in the fire regime that result in shorter fire intervals can damage the habitat for some animal species. In the types of shrublands, riparian areas, and grasslands found throughout the Project Footprint and Conservation Lands, fire can have a long-lasting and potentially negative impact on the vegetation. Ephedra and common saltbush (*Atriplex polycarpa*) do not readily recover from fire and unmanaged fire in the region would tend to favor establishment and maintenance of non-native grasses over native grasses, forbs, and shrubs (Sawyer et al. 2009).

CalFire functions as the San Benito County Fire Department (SBCFD)/ Hollister Fire Department under a contract with the County of San Benito in the vicinity of the Conservation Lands. The SBCFD located in Hollister, would be the nearest responder to the Conservation Lands with a response time to the Project site of approximately 45 minutes to one hour (San Benito County 2010). No other year-round responders from Fresno County or any other nearby jurisdictions are closer to the Conservation Lands.

2.2.10 Security/Trespass/Trash

Generally there is limited public use of the lands and public roads in the area of the Conservation Lands. Current security measures on the Conservation Lands consists of fences and locked gates along public roads and the presence of ranch operators and staff on-site. On adjacent BLM lands, motorized vehicles are typically not allowed between mid-April to mid-October due to fire season restrictions. Therefore, public access is further limited during roughly half the year. Public use of the surrounding BLM lands likely increases significantly between October and March as well as some holiday weekends and, with the increased traffic, the potential for trespass is increased. The primary forms of trespassing could include off-highway vehicle use and trespassing on foot over gates and fences.

Although public access has been restricted on the Conservation Lands, past land use practices have resulted in the abandonment and/or discarding of items such as tanks, vehicles, equipment, tires, and trash. These items are scattered throughout the Conservation Lands and in some places they may be a hazard to wildlife.

2.2.11 Research, Recreation, and Educational Uses

There are currently no authorized research, recreation, or educational uses on the Conservation Lands other than private access by landowners and their guests. Based on distributional records for various Covered Species, it appears that in the past some of the Conservation Lands were accessed for research activities associated with these species (USFWS 1998).

The Panoche Valley is a recognized "Important Bird Area" by the Audubon Society. The designation includes approximately 36,000 acres of private and public lands in the Panoche Valley and surrounding hills. BLM lands in the surrounding area and CDFW lands on Little Panoche Creek, northeast of the VRCL are frequently visited by birders. Birders also frequent the public roads in the Panoche Valley area.

The western boundary of the BLM-administered Panoche Hills Management Area is located immediately adjacent to portions of the Conservation Lands (Figure 6). Two

Wilderness Study Areas and two ACECs are located in the Panoche Hills BLM-managed properties. These lands are primarily accessed from the north along Little Panoche Road and are managed as a Special Recreation Management Area by the BLM, providing specific, structured recreation opportunities. Recreation opportunities include hiking, nature study, hunting, star-gazing, rockhounding, and camping (BLM 2009). The Panoche Hills are open all year, with peak use in the winter and spring of approximately 5 to 10 people per day during weekdays and approximately 20 to 25 people per day during the weekends (San Benito County 2010).

Additional organized recreation activities occur throughout the Panoche Valley, such as the Panoche Valley Road Race. This event is an annual cycling race which can host hundreds of racers along Panoche Road and Little Panoche Road. The 2013 race reported approximately 130 participants (USA Cycling 2013). Mercey Hot Springs, a private recreation area and retreat with hot mineral baths, is located along Little Panoche Road near the northern boundary of the VRCL in the Panoche Hills. This private campground is often visited by birders who use the cabins, campsites, and recreation vehicle facilities.

2.2.12 Existing Easements

One 230 kilovolt (kV) transmission corridor runs from northwest to southeast through the Project Footprint and VFCL with an associated easement. In addition, two pipeline easements cross Conservation Lands: one natural gas pipeline crosses VFCL and SCRCL; and one petroleum pipeline crosses SCRCL.

2.2.13 Adjacent Land Uses

The adjacent land uses are primarily cattle ranching and open space. BLM lands almost completely surround the SCRCL to the south, east, and north, and the VFCL and VRCL to the east (Figure 6). The Panoche and Llanada communities are within two miles of the Project Footprint. The nearest rural community is Firebaugh, which is approximately 15 miles from the perimeter of the Project Footprint. There are relatively small areas of agricultural development south of VFCL and west of SCRCL consisting of approximately 160 acres of irrigated crops and a small dairy along Panoche Road. There is no urban development on the Conservation Lands or surrounding area.

2.3 Site-Specific Conservation Land Descriptions

2.3.1 Valadeao Conservation Lands

General Description

The VRCL are contiguous with the Project Footprint directly to the west, east, and northeast of the site. These lands are also contiguous with the Valley Floor and SCRCL. VRCL include several seasonal drainages. The property is dominated by introduced annual grasslands (approximately 6,700 acres) and ephedra shrubland (approximately 2,700 acres), and also supports atriplex shrubland and juniper and oak woodlands.

Soils

Soils on this site range from sandy to sandy loam to clay loam to badlands. There are 10 major soil units that make up the VRCL. These soils are Panhill loam, Panoche loam, Nodhill-Wisflat-Rock outcrop complex, Los Banos clay loam, Kettleman loam, Kettleman soils, Shedd loam, Vallecitos rocky loam, Yolo gravelly loam and Yolo loam.

Panhill loam and Panoche loam are formed on the alluvial fan surfaces at the base of the Panoche Hills. The Nodhill-Wisflat-Rock outcrop complex is found on escarpments on mountain slopes while Los Banos clay loam has slopes from 2 to 15 percent and is found on alluvium terraces. Kettleman loam and Kettleman soils are strongly sloping to steep and occur in hilly to mountainous uplands. Shedd loam and Vallecitos rocky loam are made of weathered sandstone and shale and are found on hills and mountains. Lastly, Yolo gravelly loam and Yolo loam are found in close proximity to Las Aguilas Creek and was formed on the alluvial fan deposits derived from the Las Aguilas Mountains (NRCS 2015).

Topography

The VRCL contain approximately 2,945 acres with slopes between 0 and 11 percent—preferred slopes for several of the Covered Species discussed in this document.. Elevations on the VRCL range from approximately 1,400 feet to 2,100 feet above mean sea level (AMSL). The lower slopes and flats are typically grazed by cattle, whereas some of the higher elevation area is grazed by sheep.

Hydrology

The VRCL support seasonal streams, washes, and drainages, all of which are only seasonally wet or wet only during rain events. Las Aguilas and South Fork Creek are two of the largest drainages found within the VRCL. Smaller washes and drainages feed these larger creeks. Habitat for aquatic species and amphibians within these creeks includes man-made stock ponds and ephemeral pools.

Distribution of Biotic Habitats

The VRCL are contiguous with the Project Footprint directly to the west, east, and northeast of the site. These lands are also contiguous with the VFCL and SCRCL. The VRCL is the most diverse in terms of biotic habitats found on the Conservation Lands. The property is dominated by Annual Grassland (approximately 6,700 acres) and ephedra shrubland (approximately 2,700 acres), and also supports Saltbush Shrubland, and Juniper and Oak Woodlands. ephedra shrublands occur in Las Aguilas Creek, an arroyo-like wash at the southwestern edge of the VRCL, in small patches along ridgelines, steep slopes with a northern aspect, lower slopes, along other ephemeral drainages, and steep rocky and thin-soiled south-facing slopes. There is evidence that it was more widespread on the western face of the Panoche Hills prior to a widespread fire that swept this area within the last decade, leaving many large *E. californica* stumps.

Covered Species observed (either directly or by their sign) on the VRCL include CTS, GKR, San Joaquin antelope squirrel (SJAS), and SJKF. Portions of the VRCL were found to be suitable for BNLL, GKR, CTS, SJAS, and SJKF in differing acreage amounts. The VRCL also support one known CTS breeding pond and estivation habitat for an additional known CTS breeding pond located on private land. This breeding pond and estivation habitat for both ponds will be preserved in perpetuity and will increase the mitigation value for CTS.

2.3.2 Valley Floor Conservation Lands

General Description

The VFCL are contiguous with the Project Footprint, and are primarily non-native annual grassland habitat, with some seasonal ponds and vernal and ephemeral pools, as well as segments of seasonally dry Panoche and Las Aguilas Creeks. The VFCL include the entire 100-year floodplain within the previously larger Project Footprint boundary on the valley floor as well as an additional SJKF movement corridor, GKR avoidance areas, and BNLL avoidance buffers. These lands are currently grazed, which may enhance the habitat for special-status species, and this site will continue to be grazed under adaptive management as a tool for further enhancement of habitat for Covered Species.

Soils

There are five main soil units identified by the National Resource Conservation Service within the VFCL (NRCS, 2015). The soil units include the Panhill loam and Panoche loam formed on the alluvial fan surfaces at the base of the Panoche Hills; the Panoche sandy loam and Panoche loam in the central Panoche Valley; and the Yolo gravelly loam and Yolo loam found in close proximity with Las Aguilas Creek and was formed on the fan deposits derived from Las Aguilas Mountains (NRCS 2015).

The Panhill loam soil unit consists primarily of an equal mixture of sand-silt-clay with moderate high shrink-swell potential, moderate corrosion potential against unprotected steel, and high corrosion potential for concrete (AEG, 2010). The Panoche soil complex consists primarily of loam and sandy loam with a moderate shrink-swell potential, moderate corrosion potential against unprotected steel, and low corrosion potential for concrete (AEG, 2010). The Yolo soils located on the west side of the valley consist of a an even mixture of sand-silt-clay loam and gravelly loam with a low to moderate shrink-swell potential, low corrosion potential against unprotected steel, and low corrosion potential for concrete (AEG, 2010).

Topography

The VFCL is found within the Panoche Valley, a gently southeast sloping plain. Drainage from the surrounding hills is directed to a few incised channels that connect to Panoche and Las Aguilas Creeks which cross the VFCL. The VFCL is generally flat to gently sloping (generally less than one percent) toward the two aforementioned creeks.

Hydrology

The VFCL support seasonal streams, washes, and drainages, all of which are seasonally wet or wet only during rain events. Panoche Creek and Las Aguilas Creek are the largest drainages within the VFCL. Smaller washes and drainages feed these larger creeks.

Panoche Creek traverses the southern portion of the VFCL for approximately 18,700 feet. The main stem of the drainage is crossed by a bridge on Little Panoche Road, which runs north/south through the Study Area. Panoche Creek flows out of the Panoche Valley between the Panoche Hills and Tumey Hills, and northeast into the San Joaquin Valley.

Las Aguilas Creek flows into the VFCL from the west and then turns south/southeast until its confluence with Panoche Creek. In the central portion of the VFCL, Las Aguilas Creek appears to be sheetflow due to the loss of any definable channel. This drainage exhibits a bed and bank channel just prior to the confluence with Panoche Creek.

In addition to Panoche and Las Aguilas Creeks, there is an unnamed tributary of Las Aguilas Creek located within the VFCL. This unnamed drainage flows into the VFCL from the north and flows south to its confluence with Las Aguilas Creek. As with Panoche and Las Aguilas Creeks, smaller washes and drainages feed this unnamed drainage feature.

Distribution of Biotic Habitats

The VFCL are contiguous with the Project Footprint and are primarily non-native annual grassland habitat with some seasonal ponds and vernal and ephemeral pools, as well as seasonally dry Panoche and Las Aguilas Creeks. The VFCL include the entire 100-year floodplain within the Project boundary on the valley floor.

The VFCL supports several seasonally flooded pools and stock ponds, predominantly in the northern portion of the VFCL in the unnamed tributary of Las Aguilas Creek. Habitat for aquatic species and amphibians within the VFCL is limited to the few stock ponds and ephemeral pools.

Covered Species observed (either directly or by their sign) on the VFCL include GKR, SJAS, and SJKF.

2.3.3 Silver Creek Ranch Conservation Lands

General Description

During the DEIR public comment period, the Applicant consulted with the County, CDFW, USFWS, and various experts regarding additional possible mitigation for unavoidable impacts to sensitive biological resources. The Applicant then identified and secured the rights to permanently preserve and manage additional Conservation Lands in the Panoche Valley known as the Silver Creek Ranch.

The SCRCL are southeast of the Project Footprint (Figures 2 and 6). The northwestern-most corner of the SCRCL is contiguous with a portion of the VRCL. Elevations on the SCRCL range from 900 to 2,200 feet AMSL. Annual Grassland comprises the majority of ground cover on the site (approximately 8,400 acres) and is dominated by non-native species distributed sparsely over the landscape; the site also supports ephedra shrubland (approximately 2,260 acres), riparian areas, seeps, springs, and barrens. An area of tamarisk shrubland occurs along Silver Creek and small areas of emergent wetlands and marsh occur along Panoche Creek. These lands include several seasonal drainages and upland habitat as well. A full description of the biotic habitats of the Project and associated Conservation Lands is provided in Section 2.1.1. Soils on the SCRCL are less complex than those found on the VRCL and are generally characterized as well-drained and moderately permeable. SCRCL contain approximately 5,765 acres with slopes between 0 and 11 percent. While these lands are currently grazed, overutilization of range has been identified as a threat as well as a potential management tool that reduces cover of non-native annual grasses and other vegetation (USFWS 1998). If not controlled, dense annual vegetation can result in a reduction of habitat quality for many of the Covered Species. Grazing will continue as a management tool to maintain and enhance habitat for Covered Species.

Covered Species observed (either directly or by their sign) on the SCRCL include GKR, BNLL, SJAS, and SJKF. While no CTS have been observed on the SCRCL, no protocol-

level CTS surveys have taken place to date on this property. Dr. Mark Jennings (herpetologist and fisheries ecologist) identified several ephemeral ponds on the SCRCL that could serve as suitable CTS breeding habitat.

Soils

There are five main soil units identified by the National Resource Conservation Service within the VFCL. The soil units include Kettleman loam, Kettleman soils, Panhill loam, Panoche loam, and Panoche sandy loam (NRCS 2015).

Panhill loam and Panoche loam formed on the alluvial fan surfaces at the base of hills; the Panoche sandy loam and Panoche loam in the central valley areas; Kettleman loam, and Kettleman soils are strongly sloping to steep and occur in hilly to mountainous uplands (NRCS 2015).

Topography

Elevations on the SCRCL range from 900 to 2,200 feet AMSL. The SCRCL contains approximately 5,765 acres of land with slopes between 0 and 11 percent. In addition, there are areas within SCRCL that have slopes up to 50%. In the northwestern portion of the SCRCL there is a sloping plain with drainage from the surrounding hills directed to the incised channel of Panoche Creek.

Hydrology

The SCRCL contain a large network of ephemeral creeks that are dry in the summer. These smaller washes and drainages feed larger creeks located within the SCRCL. Habitat for aquatic species and amphibians within these creeks includes some man-made stock ponds, ephemeral pools, and Panoche and Silver Creeks.

Panoche Creek traverses the northern portion of the SCRCL. This main stem drainage maintains a perennial flow as it flows across Panoche Road and then outside the northern boundary of the SCRCL toward the San Joaquin Valley. Silver Creek flows into the SCRCL from the south flowing north along the southeastern boundary of the SCRCL for approximately 8,000 feet.

Distribution of Biotic Habitats

On the SCRCL, Annual Grassland is the predominant habitat (Figure 5). On the SCRCL, Annual Grassland occurs primarily on the lower slopes of the Griswold and Panoche Hills and valley bottoms, and are largely composed of non-native annuals. Grassy cover was seldom observed to exceed 20 percent, giving the area a sparsely vegetated, somewhat desert-like, appearance. In years where precipitation is not as plentiful as it was in 2010, much of the area classified as Annual Grassland may appear to be relatively barren of plants.

On the SCRCL, plant associations that were noted to occur within the ephedra shrublands include *Eriogonum fasciculatum – Ephedra californica* scrub, *Eastwoodia elegans – Ephedra californica* scrub, *Gutierrezia californica – Ephedra californica* scrub, *Ericameria linearifolia – Ephedra californica* scrub, and *Eriogonum fasciculatum – Hesperoyucca whipplei* scrub. Typically, the upland shrub assemblage at the SCRCL is neither dense nor diverse.

On the SCRCL, areas classifiable as true "Barrens" are commonly embedded within Annual Grassland on south-facing slopes and ridge areas, in both the Griswold and Panoche Hills.

On the SCRCL, riparian stands associated with seasonally or perennially moist substrates, including seeps and springs, appear to be very rare and unevenly distributed within the area. Riparian habitats occur along Panoche and Silver Creek. The riparian habitat community on Silver Creek where it briefly intersects the SCRCL indicates a seasonally wet, somewhat saline habitat subject to annual or occasional energetic flows. An extensive portion of the riparian corridor, including on the SCRCL, has become dominated by invasive tamarisk (*Tamarix* sp.), and is classified as Tamarisk Semi-Natural Shrubland. Tamarisk has developed semi-open to impassable stands in a 30 to 100 foot-wide corridor. The population extends well off-site both upstream and downstream. In this area, saltgrass appears to be the native species most tolerant of the soil salination and groundwater drawdown effects of heavy tamarisk infestation, and often forms meadow-like swards between the tamarisk thickets.

The small area of riparian woodland located south of Panoche Road is confined to the first terrace outside the saturated zone. The woodland canopy is degraded *Populus fremontii* Woodland/Forest Alliance and includes a significant presence of red willow (*Salix laevigata*) where it is most dense. The stand consists of many mature trees and snags but there is no understory and no recruitment of native saplings has occurred, presumably because of intense livestock activity.

Habitats at springs and seeps typically support plant species that are dependent on a reliable source of shallow groundwater to survive the annual dry period (typically May-October), and the vegetation extent would be expected to narrowly adhere to the physical characteristics of the wetted zone. Plant associations adjacent to these resources would be subject to continuation of livestock grazing utilized to manage the SCRCL to benefit Covered Species. No flowing springs were found in upland areas during the September 2010 survey. Evidence of seep zones that provide ephemeral flows and sustained root zone moisture in an upland setting was found only within one relatively deeply incised canyon near the southern survey edge. At the floor of this canyon, a small area of well-developed episalic crust was found at a clear shift from shrublands to dominance by saltgrass (*Distichlis spicata*).

Panoche Creek was observed to be completely dry and largely devoid of plants for at least three miles upstream of the site. Within the surveyed area, this arroyo-like habitat quickly transitions to zonal wetlands characterized by gaseous springs, highly reduced soils, and marsh or meadow vegetation. The Panoche Creek riparian zone, which ranges from 100 feet to 500 feet in width, may provide the only reliable, naturally occurring surface water for much of the year. The dominant plants are consistently arrayed, with vegetation classified as emergent Typha marsh (*Typha* Herbaceous Alliance) centrally, and *Schoenoplectus americanus* mid-marsh (*Schoenoplectus americanus* Herbaceous Alliance) at the outer saturated edge, and *Distichlis spicata* meadow (*Distichlis spicata* Herbaceous Alliance) extending across the moistened to seasonally drying soils at the riparian edge.

Two constructed ponds were identified on the SCRCL. Constructed water tanks and troughs for livestock are more common on the SCRCL, as the area appears to be largely devoid of naturally occurring, fresh surface water during the normal dry season.

2.3.4 Regional Conservation Importance

The Conservation Lands were specifically selected due to the presence of threatened and endangered species and their proximity to large, contiguous blocks of lands administered by the BLM. This natural area is known to support substantial populations of state and/or federally-listed species including SJKF, GKR, BNLL, and SJAS; four species that will benefit from the implementation of this plan. Additional state- and federal-listed species that are present in the region in lower numbers and that will benefit from management of these Conservation Lands include California tiger salamander (CTS; *Ambystoma californiense*), California condor (CACO; *Gymnogyps californianus*), and several branchiopods species such as Vernal Pool Fairy Shrimp (VPFS; *Branchinecta lynchi*), and possibly Longhorn Fairy Shrimp (LHFS; *Branchinecta longiantenna*), Conservancy Fairy Shrimp (CFS; *Branchinecta conservatio*) and Vernal Pool Tadpole Shrimp (VPTS; *Lepidurus packardi*).

The Project and the Conservation Lands are located within a portion of the Ciervo-Panoche Natural Area, an area that has long been a focus of conservation for several of the regionally listed species. Unlike the two remaining core habitat areas for the listed desert species (Carrizo Plain and western Kern County), the Panoche Valley lies relatively far to the north (approximately 200 km). This results in different environmental conditions (e.g. rainfall patterns). Therefore, having much of the Panoche area permanently protected would buffer populations against stochastic events that could cause extinction in the southern core areas.

The Panoche Valley area is also critical for maintaining connectivity between habitat areas to the north and south. This connectivity is particularly crucial for San Joaquin kit foxes. Lands to the west of the region are generally too rugged with unsuitable vegetation communities and that cannot serve as effective movement corridors. Lands to the east have almost all been converted to agriculture and are not conducive to migration by foxes

and other sensitive species. Thus, it is important to maintain a viable north-south linkage for San Joaquin kit fox in the Panoche Valley region.

The Silver Creek Ranch is specifically identified in the Recovery Plan for Upland Species of the San Joaquin Valley (Recovery Plan, USFWS 1998) and the Recovery Plan 5-year Reviews (USFWS 2010a, 2010b, 2010c) as an area with high habitat value for Threatened and Endangered (T&E) Species. The Recovery Plan also identifies BLM's program of acquisition in which the Silver Creek Ranch is one of the two main ranches targeted for purchase. The Recovery Plan, in reference to GKR, also has a goal to "protect all existing natural land on the Silver Creek Ranch…" (Page 95). In reference to BNLL, the Recovery Plan aims to "protect additional habitat for them in key portions of their range; areas of highest priority to target for protection are: … Natural lands in the Panoche Valley area of Silver Creek Ranch, San Benito County" (Page 122). By preserving the SCRCL, the Action will preserve a "highest priority" area identified in the Recovery Plan for these listed species that is currently unprotected.

The proposed management activities on the Conservation Lands will contribute to recovery goals established by the USFWS for some of the Covered Species. Specifically, protection, enhancement, establishment, management, and monitoring of these Conservation Lands will contribute towards the following Recovery Tasks in the Recovery Plan (USFWS 1998):

- Protect natural lands in the Ciervo-Panoche Natural Area (Priority 1; Tier 2 – Task 2.1.14);
- Protect grass and shrubland communities on western Valley edge, Santa Nella to Panoche Creek (Priority 2; Tier 4 – Task 5.3.4).

The permanent conservation and subsequent enhancement, management, and monitoring of these Conservation Lands will include gathering of data that could additionally contribute toward several broad tasks related to species conservation, including the following:

- Conduct censuses for SJKF and monitoring for multiple animal species in the Ciervo-Panoche area (Priority 2; Tier 4 – Task 4.38);
- Access for survey, census, demographic, and other studies (Multiple species; various tasks).

2.3.4.1 Habitat Corridors

Management actions that protect, maintain, and enhance the Conservation Lands and corridors between habitat areas on and between the VFCL, SCRCL, and VRCL will create a network of Conservation Lands that complements and provides important linkages to other protected lands (e.g., adjacent BLM lands), lands supporting Covered Species, and regional conservation efforts (Figure 8). These corridors include:

A north-south corridor of natural habitat that passes through the project will be protected from disturbance (with the exception of the existing road, emergency access crossing, and the planned project perimeter road) during project construction,operations and maintenance.

A 500 meter- (1,640.4 feet) wide and approximately 2,484 meter- (8,000 linear feet) long east-west corridor associated with the existing Las Aguilas Creek /VFCL corridor has been included in the Project and will be beneficial in providing additional undisturbed connectivity. The corridor will promote movement through the site and provide access to the Panoche Hills and BLM lands to the north. The undisturbed VFCL along Las Aguilas Creek will be widened to accommodate this SJKF corridor enhancement.

The Panoche Creek Corridor and associated VFCL intersects the southern portion of the VFCL in a west to southeast direction. This corridor provides connectivity to the large block and high quality habitats (e.g., grassland flats) to the west of the project including the Gabilan Range and eventually through to the SCRCL and the BLM lands beyond. The southern portion of the VFCL also provides unimpeded west-to-east travel corridors from the Panoche Creek wash (and adjacent flats) to the VRCL and adjacent Tumey Hills/Panoche Hills BLM landholdings including the Las Aguilas Creek drainage.

The Moss-Panoche 230kV Transmission Line Corridor bisects the southwestern portion of the project footprint and associated VFCL in a northwest to southeast direction. This 22.48-meter (75 feet) corridor provides connectivity to the habitats (e.g., grassland flats, Panoche Creek wash) to the west of the project including the Gabilan Range and eventually through to SCRCL and adjacent BLM landholdings.

3.0 Activities To Be Completed Prior to Long-term Management

All Conservation Lands protection, restoration, enhancement, relocation, and monitoring activities will be subject to the stipulations contained in permits issued for the project including the BO and the ITP.

The Conservation Easement(s) will be granted and recorded on the Conservation Lands consistent with BO and ITP requirements. The purpose of the Conservation Easement(s) is to preserve and protect the Conservation Lands in perpetuity consistent with the requirements and prohibited activities contained in the easements. The responsibilities held by the grantee of the easements will be funded through the establishment of an endowment. The Conservation Easement grantee will be an entity approved by CDFW and USFWS. Conservation Lands will be managed for the benefit of the various habitats and species according to this HMP and the best available science.

The remainder of this section describes the general methods for implementation of mitigation activities that are to be completed prior to start of the Long-Term Management, or that are not part of long-term management activities described later in this document. These activities will be directed by the Restoration Biologist and implemented by a contracted entity, the Restoration Contractor. A portion of this restoration and enhancement work was originally described in the Wetland Mitigation Monitoring Plan (WMMP) attached as Appendix E. These immediate mitigation activities include trash and debris removal, CTS pond creation, vernal pool enhancement, and riparian restoration through cattle exclusionary fencing (Figure 12). All mitigation activities will be designed to avoid impacts to nesting birds and listed species.

3.1 Removal and Enhancement of Seven Debris Dump Sites

3.1.1 Action

PVS has identified seven areas on the Conservation Lands where debris (trash) dumping has occurred. Debris in these areas includes scrap metal, tires, appliances, and other large debris. As part of the WMMP, the Applicant will remove debris from these areas allowing the natural environment to restabilize. Once the debris is removed, the Restoration Contractor will seed the area as deemed necessary by the Restoration Biologist, with a locally sourced native seed mix. The planting methodologies and plant palettes that will be implemented are described in detail in the Habitat Restoration and Revegetation Plan prepared by AMEC Foster Wheeler in May 2015. The seed mix that is to be used for debris removal areas within disturbed channel areas can be seen in Table 3 below. Seeding the area will decrease soil erosion and siltation, which will ultimately enhance the upstream and downstream drainages of the debris dump sites. Using local seed sources will increase likelihood that the plants will be well adapted, thus increasing restoration success and supporting the health and sustainability of local populations of these species. Removal of the debris will enhance the area associated with approximately 19,386 square feet (0.44 acre or approximately 652 linear feet) of aquatic habitat by removing debris and reseeding where it is deemed necessary. At the discretion of the Restoration Biologist in areas where seeding occurs, a temporary exclusion fence to deter cattle grazing may be installed for a minimum of six months, or until the Restoration Biologist determines successful growth of seeded plants.

Table 3. Seed Mix for Channel and Sloped Areas

Botanical Name	Common Name	Life Cycle	Mature Height (feet)
Distichlis spicata	Saltgrass	Perennial	1.1
Heliotropium curassivicum	Salt heliotrope	Perennial	0.5
Nassella pulchra	Purple needlegrass	Perennial	3

Poa secunda	One sided bluegrass	Perennial	1.5
Croton setigerus	Dove weed	Annual	1.5
Deschampsia danthonioides	Annual hairgrass	Annual	1.5
Eschscholzia caespitosa	Tufted poppy	Annual	1
Lasthenia californica	Goldfields	Annual	0.5
Lotus wrangelianus	California lotus	Annual	1.5
Lupinus succulentis	Arroyo lupine	Annual	2
Triclostema lanceolata	Vinegarweed	Annual	1.5
Vulpia microstachys	Annual fescue	Annual	1.5
Substitute Species	**Common Name**	**Life Cycle**	**Mature Height (feet)**
Bromus carinatus	California brome	Perennial	3
*Cynadon dactylon***	Bermuda grass	Perennial	1
*Lolium multiflorum***	Italian rye grass	Annual	2

**denotes non-native species

All debris will be removed by hand or by mechanical equipment (e.g.,track hoe) to a truck-mounted container using pre-existing roadways. Once removed, the debris will be disposed of according to federal, state, and local regulations and taken to an approved permitted landfill or recycling center. Any debris deemed potentially hazardous will be dealt with in an approved manner so as not to further harm the environment. Any heavy equipment (e.g., backhoe, crane) utilized to remove the debris will be operated outside the top of banks to preserve bank stability and decrease erosion potential. If it is determined during implementation that removing the debris would cause instability in the drainage or displace sensitive species that have created artificial habitat in the debris, the material will be left in place. While complete removal may not be feasible, any removal

of potentially harmful debris material from these areas will be an overall benefit for the identified stream channels and to the wildlife which occupy the riparian areas.

3.1.2 Rationale

Seven areas have been identified on the Conservation Lands where unpermitted landfill dumping has occurred (Figure 16). These areas are laden with scrap metal, tires, appliances, and other large debris. As part of this HMP (and described in detail in the WMMP), the debris from these areas will be removed and the area reseeded with locally sourced native plants to decrease soil erosion and siltation and ultimately enhance the drainages and channels downstream of the removal sites. Reseeding will also enhance native plant populations and create potentially suitable high quality habitat for native animal species. Removal of the debris and potential reseeding will result in the enhancement of approximately 0.44 acres of aquatic habitat and help restore the natural stability of the channel.

3.1.3 Risks/Challenges

Due to the amount of time the debris has been situated within each respective stream channel, slight erosion along the stream channel may occur as a result of debris removal. If during the removal process the designated biologist is concerned that the removal of certain debris will lead to greater issues within the channel (i.e., increased erosion or bank instability), these items may be left within the channel to protect stream stability.

Debris removalsites will be monitored after large rain events (defined as greater than 0.5 inches of precipitation in a 24-hour period) for the first two years, than annually during the wet season for the next three years to document any changes to bank stability (i.e., erosion concerns). Observations from monitoring shall be provided to the Land Manager and CDFW in the annual report.

3.1.4 Implementation Details

All debris will be removed by hand or mechanical equipment (e.g., track hoe) to a truck-mounted container using pre-existing roadways. Once removed, the debris will be

disposed of according to federal, state, and local regulations and taken to an approved, permitted landfill or recycling center. Any debris categorized as hazardous waste will be dealt with in an appropriate manner so as to not cause further harm to the environment. During implementation, if it is determined that removing the debris would cause instability in the creek, then the material will remain in place.

Prior to the debris removal process, a pre-disturbance survey will be conducted by an agency-approved biologist or their representative. The biologist(s) shall identify and clearly mark the location of special-status species and their dens, burrows, or habitats for the purpose of avoiding those areas. If necessary, buffers will be established with highly visible markers. Furthermore, the Restoration Biologist or their representative shall be present while ground-disturbing activities are occurring. In addition to conducting preconstruction surveys, the biologist(s) shall aid debris removal crews in satisfying take avoidance criteria and implementing mitigation measures; document all pertinent information concerning effects on special-status species; and assist in minimizing the adverse effects of the debris removal on special status species.

Debris Removal Areas #1a and 1b are located on the VRCL east of the Project Footprint and are comprised of two smaller areas of debris at 36°38'54.98"North and 120°49'43.47"West. The Applicant will remove the debris and enhance approximately 537 ft^2 (0.012 acre) of land. This debris dumpsite is located within an incised stream channel. Removal of this debris will enhance the area associated with approximately 73 linear feet of stream channel. If practicable, reseeding with native seed will further enhance the habitat in the trash removal areas.

Debris Removal Area #2 is located on the SCRCL southeast of the Project Footprint at 36°33'50.93"North and 120°45'10.83"West. This debris pile is comprised of an old metal water tank that has been discarded within an ephemeral drainage and appears to be blocking the natural flow. The Applicant will remove debris and enhance approximately 0.008 acre of land. Removal of this debris pile coupled with bank stabilization, if necessary, will enhance the health and integrity of drainage downstream of the debris removal location. This debris dumpsite is located within an incised stream channel.

Removal of this debris will enhance approximately 23 linear feet of stream channel. If practicable, reseeding with native seed will further enhance the habitat in the trash removal area.

Debris Removal Area #3 is located on the VRCL east of the Project Footprint at 36°39'12.66"North and 120°49'24.39"West. This debris pile is located directly within an ephemeral drainage and is comprised of discarded water tanks. The applicant will remove debris and enhance approximately 67 ft^2 (0.002 acre) of the drainage. Removal of the debris within the drainage will enhance the health and integrity of the drainage. This debris dumpsite is located within an incised stream channel. Removal of this debris will enhance approximately 17 linear feet of stream channel. If practicable, reseeding with native seed will further enhance the habitat in the trash removal area.

Debris Removal Area #4 is located on the SCRCL southeast of the Project Footprint. This large debris pile sits directly south and adjacent to Panoche Creek at 36°35'7.57"North and 120°47'12.04"West. This debris pile is comprised of old tires, appliances, household debris, abandoned automobiles, etc. The Applicant will remove debris and enhance approximately 12,416 ft^2 (0.28 acre) of land. Removal of this debris pile coupled with bank stabilization will enhance the health and integrity of Panoche Creek both upstream and downstream of the debris pile. This debris dumpsite is located within an incised stream channel. Removal of this debris will enhance the area associated with approximately 328 linear feet of stream channel. If practicable, reseeding with native seed will further enhance the habitat in the trash removal area.

Debris Removal Area #5 is located on the VRCL north/northeast of the Project Footprint at 36°40'55.64"North and 120°51'23.55"West. This debris pile is comprised of old tires and other ranch-related debris and is located within an ephemeral drainage. Removal of the debris will enhance approximately 5,096 ft^2 (0.116 acre) of the ephemeral drainage. This debris dumpsite is located within an incised stream channel. Removal of this debris will enhance the area associated with approximately 164 linear feet of stream channel. If practicable, reseeding with native seed will further enhance the habitat in the trash removal area.

Debris Removal Area #6a is located on the VRCL southeast of the Project Footprint at 36°36'30.11" North and 120°48'12.97" West. This debris pile is comprised of old tires, appliances, household debris, etc. The Applicant will remove debris and enhance approximately 734 ft² (0.017 acre) of land. Removal of this debris pile coupled with bank stabilization will enhance the health and integrity of the ephemeral channel both upstream and downstream of the debris pile. This debris dumpsite is located within an incised stream channel. Removal of this debris will enhance the area associated with approximately 22 linear feet of the stream channel. If practicable, reseeding with native seed will further enhance the habitat in the trash removal area.

Debris Removal Area #6b is located approximately 120 feet northeast of Debris Removal Area #6a on the VRCL southeast of the Project Footprint at 36°36'31.09" North and 120°48'11.94" West. This debris pile is comprised of old household appliances, fencing material debris, metal scraps, old water troughs, etc. The Applicant will remove debris and enhance approximately 66 ft² (0.001 acre) of land. Removal of this debris pile coupled with bank stabilization will enhance the health and integrity of the ephemeral drainage both upstream and downstream of the debris pile. This debris dumpsite is located within an incised stream channel. Removal of this debris will enhance the area associated with approximately 10 linear feet of stream channel. If practicable, reseeding with native seed will further enhance the habitat in the trash removal area.

Debris Removal Area #7 is located on the VRCL north-northeast of the Project Footprint at 36°36'51.76"North and 120°48'18.91"West. This debris pile is comprised of old tires and other ranch-related debris and is located within an ephemeral drainage. Removal of the debris will enhance approximately 130 ft^2 (0.003 acre) of the ephemeral drainage. This debris dumpsite is located within an incised stream channel. Removal of this debris will enhance the area associated with approximately 15 linear feet of stream channel. If practicable, reseeding with native seed will further enhance the habitat in the trash removal area.

3.1.5 Monitoring Objectives, Performance Criteria, and Methods

Monitoring Objective

To monitor conditions during and after the removal of debris from dumping sites on the Conservation Lands.

Performance Criteria

A biologist will indicate all debris has been removed (unless specifically left in the creek channel to maintain stability). Annual qualitative assessments will be conducted to determine whether the erosion potential is similar to other areas within the channel. This qualitative assessment will also determine whether the post-removal contours, elevations, and the slope and the stability of the stream channel(s) are consistent with the areas directly upstream and downstream of the debris removal areas. The final portion of the assessment will confirm that no significant post-removal contours exist that could potentially obstruct stream flow.

Additional performance standards for the debris removal areas include:

- The acreage of ephemeral drainages enhanced must equal 0.39 acres (17,173 ft^2);
- The elevation of the streambed of the ephemeral drainages where the debris is removed must be lower than the upstream streambed and must be higher than the downstream streambed such that when water is flowing there is no obvious impediment to or obstruction;
- All debris shall be removed from within the enhanced federally jurisdictional ephemeral drainages, unless the USACE provides written approval that some debris may be retained to maintain stability of the drainage.
- The performance standard for the vegetation in the debris removal areas includes:
    1. By year 3, the enhanced ephemeral drainages will have an absolute cover of plant species equal to a minimum of 50% of the absolute cover of reference sites upstream and downstream of the enhanced area within the same ephemeral drainage, reference sites are available immediately downstream or upstream that have the same characteristics as the debris removal site;
    2. By year 5, the enhanced ephemeral drainages will have an absolute cover of plant species equal to a minimum of 85% of reference sites upstream and downstream of the enhanced area within the same ephemeral drainage if reference sites are available immediately downstream that have the same characteristics as the debris removal site.
- The number and relative cover of invasive plants, which are not considered common and abundant by the Project's Weed Control Plan plants, in the enhanced ephemeral drainage must be equal to or less than the number and relative cover of invasive plants in the reference sites within the same ephemeral drainage upstream and downstream of the enhanced area.

- The number and relative cover of hydrophytic plants (i.e. FAC, FACW, OBL) in the enhancement areas must meet or exceed the number and relative cover in the reference sites in the upstream and downstream portion of the same drainage if reference sites are available immediately downstream or upstream that have the same characteristics as the debris removal site.

Methods

Prior to the removal of the debris, photo points will be established in appropriate locations and photos taken to provide baseline conditions. During the removal process, a monitor will observe the process to document all debris that is removed. Once the debris is removed, the Restoration Contractor will reseed with a locally sourced native seed mix in the debris removal area as deemed necessary by the Restoration Biologist in coordination with CDFW to prevent erosion and help re-establish the native vegetation structure. At that time, additional photographs will be taken from the photo points to be included in the annual report. Photos taken at the pre-established photo-point locations will document success of debris removal at each of the debris areas. If significant erosion is observed and/or no revegetation is observed, additional seeding or other stabilization methods (e.g., non-toxic chemical stabilizers, straw mulch) may be employed as deemed necessary by the Restoration Biologist. In addition, during the photo-point assessments, any observations of non-native, invasive plant species in the enhancement areas will be noted and mapped for inclusion in the annual report.

3.2 Partial Livestock Exclusion to Restore Native Vegetation and Riparian Areas to Portions of Panoche Creek

3.2.1 Action

The Restoration Contractor will install approximately 0.35 mile of fencing in addition to the existing 0.47 mile of fence to exclude cattle from grazing in approximately 11.16 acres of waters of the State for a majority of the year. Approximately 5.81 acres of the 11.16 acres of waters of the State that are present within this area of Panoche Creekare also categorized as federally jurisdictional waters. Livestock exclusion will allow for revegetation of riparian areas along the banks and slopes while also decreasing erosion and siltation. This exclusion of livestock is expected to improve the health and integrity

of Panoche Creek and downstream functions and values by directly enhancing approximately 1,748 linear feet of the stream channel.

3.2.2 Rationale

Certain areas along creeks and drainages within the Conservation Lands are experiencing erosion due to heavy livestock grazing, which is adding to the siltation of these features. Vegetation within these grazed areas has been reduced to remnants of riparian habitat with little understory development or recruitment of native species.

3.2.3 Risks/Challenges

The removal of grazing pressure could lead to an increase in invasive species density and cover that have the ability to thrive in disturbed habitats.

3.2.4 Implementation Details

Through an adaptive management program, grazing livestock (cattle, sheep, horses) and feral animals (e.g., feral pigs) will be strategically kept out of the exclusion areas for the majority of the year. Transect assessments will be conducted to evaluate the success of the livestock exclusion. If the results of the transect assessments do not meet success criteria, locally sourced native vegetation will be planted to enhance these natural features andincrease the biotic value for local species. Livestock will be allowed to graze on the remainder of the Conservation Lands outside the exclusion area, but will be managed and monitored in order to maximize benefits to the special-status species that inhabit the Conservation Lands. To properly manage grazing practices, the applicable standards and guidelines included in the BLM's Central California Standards for Rangeland Health and Guidelines for Livestock Grazing (1999) are incorporated into the Grazing Management portions of this plan.

The effectiveness of the required activities will be evaluated by the Land Manager, qualified biologists, or appropriate personnel when reporting on the aforementioned mitigation plans. Any requirements found to be inadequate will be subject to adaptive management strategies and recommendations made in the annual report.

3.2.5 Monitoring Objectives, Performance Criteria, and Methods

Monitoring Objectives

The purpose of monitoring the exclusion areas is to improve and evaluate the exclusionary actions and their improvementsto the wetland and riparian habitat within the grazing exclusion area.

Performance Criteria

Efforts will be made to find a potential reference site for the livestock exclusion area that is within the vicinity of the exclusion area (4 mile radius). If a reference site is located, the woody stem, shrub and tree species will be assessed for the number of species from each group. From the assessment of the reference site, the livestock exclusion area will seek to have at least 20-30 percent of the total number of wood stem, shrubs, and tree species from the reference site. However, if an appropriate reference site cannot be located or accessed (landowner permission), the performance standard for the livestock exclusion area will seek to increase woody stem density or cover by at least 10 percent over baseline conditions within the exclusion area, which must equal 5.81 acres, as required by the mitigation plan, with the species available within the Panoche Creek riparian area within Silver Creek Ranch.

Cover of woody stem species including *Populus fremontii, Salix sp., Baccharis salicifolia, Atriplex lentiformis*, and other shrubs and trees found in the Panoche Creek riparian area within Silver Creek Ranch shall be increased by at least 10% over existing conditions. Non-native, invasive plant species populations will be managed per the Weed Control Plan so they do not impact the enhancement process within the exclusion area. Aerial cover estimates for trees and shrubs provide a reasonable gauge of plant community development five to 10 years after initial plant establishment. There will be a quantitative assessment to indicate that woody cover has exceeded 10 percent by the end of the five to 10 year time period.

Methods

The methods for the monitoring of the livestock exclusion area on a portion of Panoche Creek in the SCRCL (Figure 12) include:

- Measuring either woody stem density or cover of woody species within 15-m belt transect(s) on both sides of the stream, measuring from the outer edge of the cattails out onto the lower bench of the wash (i.e., where the cut bank is closer than 15 m, and only including the area up to the bottom of the bank).
- Counting either woody stems (to obtain density within the belt) or estimate cover within the area covered by the belt in year 1 (Note: advisable to compile both density and cover).
- Establishing photo points within the livestock exclusion area and in the grazed area adjacent to the exclusion area (either upstream or downstream in riparian habitat with similar existing structure) at 100-m intervals from both sides of the streambed, preferably at a distance of approximately 30 m from the stream edge. The same number of photo points should be established on both the grazed and exclusion areas. The purpose of photo points is to assess observable qualitative changes.
- Follow up by repeating 10-m belt transects in years 2 through 5.
- If the performance criteria has not been met:
    - by year 3, conduct a qualitative assessment to determine whether there are variables that are preventing the desired rate of establishment (e.g., hydrologic conditions and precipitation, invasive plant abundance, slower than expected growth and establishment of woody plant species)
    - by year 5, and the cover measurements are not increasing across years, consider other options such as active restoration by planting cuttings of woody species (*Salix* spp., *Populus fremontii*, *Baccharis salicifolia*, *Atriplex lentiformis*, etc.) collected from within Panoche Creek on Silver Creek Ranch using a planting plan prepared by a qualified botanist, restoration ecologist, or wetland specialist. A plan for implementation of remedial measures would be provided in the annual report.

- At the discretion of the specialist who prepares the planting plan, the width of the belt may be increased to accommodate a more extensive restoration area.
- During the belt surveys and the photo point assessments, any observations of non-native, invasive plant species in the enhancement area will be noted and mapped for inclusion in the annual report.

3.3 Creation of CTS Breeding Ponds

3.3.1 Action

PVS will construct up to three CTS breeding ponds meeting the following criteria in accordance with the attached *Panoche Valley Solar Farm California Tiger Salamander Mitigation Pond Proposal* (Appendix G).

3.3.2 Rationale

The CTS ponds will be created as compensatory mitigation requirements set forth by CDFW and USFWS to offset potential impacts to CTS during the construction of the Project.

3.3.3 Risks/Challenges

Created ponds are dependent on precipitation for inundation. It is uncertain as to whether there will be sufficient rainfall and appropriate retention of water needed for CTS breeding. The CTS mitigation ponds may require the construction of shallow diversion canals perpendicular to the slope to capture sheet flow and direct it to the ponds to allow the ponds to remain inundated for a sufficient length of time. Exfiltration rates are the ruling factor in sizing the pond(s), as these are many times higher than the evaporation rates during winter and spring. To reduce the amount of exfiltration, the *in-situ* native soil may be amended with a Bentomat 200R Geosynthetic clay liner that improves retention rates.

3.3.4 Implementation Details

As stated in the FEIR, impacts to the CTS shall be mitigated by providing habitat preservation, enhancement, and management in perpetuity at graduated ratios for upland estivation habitat.

Breeding habitats and suitable upland estivation habitat impacted within 640 meters (2,100 feet) of a known or potential breeding pond will be mitigated at a ratio of 3:1, suitable upland habitat located between 2,100 feet and 804.6 meters (2,640 feet) of a breeding pond will be mitigated at a ratio of 2:1, and suitable upland habitat located between 804.6 meters (2,640 feet) and 2,023 meters (6,636 feet) of a breeding pond will be mitigated at a ratio of 1:1. Preserved and permanently protected CTS estivation habitat shall be the same quality or better quality than the habitat disturbed and will be located on the VFCL, VRCL, and SCRCL. In addition, PVS will be creating new breeding habitat on the VRCL, which will be preserved and managed in perpetuity. The three potential ponds are discussed in greater detail below.

CTS Pond 1 is located on VRCL approximately 701 meters (2,300 feet) west-northwest of Pond #12, has a drainage area of approximately 0.44 square miles, and has 70 percent of the surface area of Pond #12. However, a higher rainfall as runoff capture ratio is expected for Pond 1 than for Pond #12 and it is expected to fill to 0.14 acre with a bypass spillway required for excess water to leave the pond and continue downhill. CTS Pond 1 is not expected to divert water that flows to the known CTS breeding pond (Pond #12). This is the preferred pond location, as this location will help to facilitate a breeding complex which may support genetic diversity and provide multiple breeding pond options for CTS in the vicinity.

CTS Pond 2 is located on VRCL approximately 610 meters (2,000 feet) south-southwest of Pond #12 andhas a drainage area approximately half the size of Pond #12. This site would support a pond of approximately 0.1 acre, with a maximum depth of just over one foot occurring in February. This pond would potentially need either an incised channel or diversion dam(s) in order to collect enough sheetflow into the pond. Currently, a piped spring fills a water trough here, and this piped spring may potentially be used to fill the

pond in dry years and would return to watering the trough after the breeding season so it dries out. Pond 2 is not expected to capture water on its way downhill to the known CTS breeding pond (Pond #12). This would be a secondary location for a pond on the VRCL.

*CTS Pond 3*is approximately 270 meters (885 feet) away from Pond #12. This site is located approximately 120 feet from where an incised channel transitions into sheet flow. The Pond is fed by an ephemeral drainage to the northwest and has a watershed drainage area of 0.65 mi^2 (416 acres). The water budget analysis found that the drainage would support a pond of approximately 0.11 acre, with a maximum depth of 2.1 feet occurring during the month of February. Based on topographic information and aerial imagery the sheet flow contributing to Pond 3 won't have any negative impact on the flows contributing to existing Pond 12, despite their proximity.

A relocation program for individuals detected during preconstruction surveys and construction monitoring will be implemented during Project build-out, and with the conditional approval of the regulatory agencies, could potentially be used to help populate the areas of newly created CTS breeding habitat.

The objectives of potential CTS mitigation pond locations are listed below:

- Mitigation ponds will be no more than 3 feet deep.
- The ideal footprint for each of the mitigation ponds will be similar to that of Pond #12 (the known breeding pond located on the VRCL).
- Mitigation ponds will be ephemeral, filling in late fall, winter, and spring, and drying out by early June. Critical months of inundation are March–May.
- Mitigation ponds are desired to be inundated for five out of every ten years, with a minimum of three out of every ten years. Inundation will be determined by the extent of annual rainfall.

Total CTS pool creation will be approximately 0.50 acre. These ponds will be preserved and managed in perpetuity. CTS ponds will be monitored twice a year to determine inundation and depth and to remove potentially harmful plants and wildlife (i.e., non-native invasive plant species and bullfrogs; non-native naturalized grasses would not be

removed). Please see Section 6.0 for additional information on monitoring details. Removal of potentially harmful plants and animals will be at the discretion of the Restoration Biologist. Non-native naturalized grasses would not be removed.

3.3.5 Monitoring Objectives, Performance Criteria, and Methods

Monitoring Objectives

Evaluate constructed CTS breeding pool(s) during the wet season and during drawdown period.

Performance Criteria

The construction of the three CTS breeding ponds will capture sufficient surface water runoff to fill the constructed ponds to approximately 3 feet (36 inches) during the wet season and will have continuous inundation for sufficient time for CTS larval development and metamorphosis (at least 10 weeks) for a minimum of 3 years of the 10 year monitoring period. Information regarding the duration and depth of inundation shall be documented with data loggers or continuous monitoring. Additional performance standards for the construction of the CTS breeding ponds include:

- The depth of the ponds shall be designed such that the ponds are inundated no more than 3 feet and will naturally dry-down no later than September of each year to preclude bullfrogs from colonizing the ponds and to successfully recruit metamorphs.

- Under average rainfall conditions the ponds will be inundated a minimum of 3 out of every 10 years.

- For all years in which ponds are not inundated for at least 10 weeks, average depth and duration of water in the mitigation ponds must be within the range of the reference Breeding Pond 12. Information regarding the duration and depth of inundation shall be documented with data loggers or continuous monitoring.

- Hydrologically, the performance standards are designed so that the three constructed breeding ponds will replicate the conditions observed in the reference pond (Pond 12, an existing CTS breeding pond). The approximate volume of the reference pond (Pond 12) will be estimated when dry or inundated depending upon the amount of annual rainfall for the study year and used a reference volume against the three created mitigation ponds. Success of the mitigation pond will be found sufficiently inundated if water volume and depth in created ponds is within 10-30% of the volume to size ratio for Pond 12 and within 10-20% of the of the planned 3 feet of planned inundation depth.

- Qualitative assessments will also be performed to determine whether the vegetation communities of the constructed ponds match those of the reference pond on the Conservation Lands. This includes percent cover of vegetation as well as species composition in terms of the distribution of native and invasive species within 30 meters of the reference pond.

- The performance standard for the vegetation of the constructed CTS also includes that:

    1. By year 3, the constructed ponds will have an absolute cover of plant species equal to a minimum of 50% of the absolute cover of the reference pond;

    2. By year 7, the ponds will have an absolute cover of plant species equal to a minimum of 75% of the absolute cover of the reference pond;

    3. By year 10, the ponds will have an absolute cover of plant species equal to a minimum of 95% of the absolute cover of the reference pond.

- The number and relative cover of invasive plants, which are not considered common and abundant by the Project's Weed Control Plan, in the mitigation ponds must be equal to or be less than the number and relative cover of invasive plants in the reference pond.

- The total number and relative cover of hydrophytic plants (i.e. FAC, FACW, OBL) in the constructed CTS breeding ponds must meet or exceed the number and relative cover in the reference pond.

- The constructed CTS breeding ponds shall meet the requirements of a wetland or other water as identified by the USACE in the 1987 Wetland Delineation Manual, Regional Supplement. A delineation of waters of the U.S. shall be completed by a qualified biologist and submitted to the USACE in years 5 and 10 of the monitoring period. The acreage of wetlands or other waters shall equal 0.5 acre, as required in the mitigation plan.

Methods

The methods for monitoring the constructed CTS breeding pond(s) include:

- Monitoring the structural components of the pond and associated structures. Due to the presence of livestock, which will be allowed to graze in the area of the pond, there is a possibility that the livestock could damage the pond which could impact the effectiveness of the pond to retain water. However, livestock grazing has also been associated with increased vernal pond water retention (Marty 2005). Temporary fencing to exclude livestock from grazing may be used to protect the pond. Any damage will be repaired outside the rainy season to avoid impacts to CTS.
- Tracking of rainfall during the rainy season (November through March) within the Project area to determine the rainfall amount for the five-year monitoring period and how it compares to the long-term average.
- Establishing photo points preferably at a distance of approximately 30 m from the pond edge and taking photographs during the rainy season and at the end of the rainy season to document proper seasonal dry-down of the pond. The purpose of photo points would be to assess observable qualitative and quantitative changes.
- Following-up with repeat surveys during a typical rainfall year to assess the pond's ability to hold water for at least 10 weeks, which is the minimum amount of time to successfully recruit metamorphs from the pond(s). In addition, there

will be a survey during the dry season to document if the pond(s) are ephemeral, filling in late fall, winter, and spring, and drying out by early June to determine adequate dry-down and confirm that no colonization by bullfrogs (a predator of CTS) has occurred.

- Sampling for the presence of CTS eggs and/or larvae.

3.4 Vernal and Ephemeral Pool Enhancement

3.4.1 Action

PVS will enhance approximately 0.05 acre of vernal pools within the VFCL to offset the impacts to two vernal pools (0.05 acre) from the Project. Enhancement of vernal pools will consist of seeding existing pools within the VFCL with a local seed source. A minimum of two pools (each with an enhancement area of approximately 0.025 acre [1,089 ft^2]) will be enhanced to offset impacts to pools within the Project Footprint. Enhancement activities will be conducted on pools that have been degraded by livestock grazing, rangeland activity, and other sources of environmental stress. The seed collection should be conducted to not substantially impact the existing pools on-site. Source pools should not be in the same locations as the reference pools used for monitoring.

3.4.2 Rationale

The vernal and ephemeral pool enhancement will be completed to comply with compensatory mitigation requirements that will be set forth in the Central Valley Regional Water Quality Control Board Waste Discharge Requirements issued for the construction of the Project.

3.4.3 Risks/Challenges

Temporary disturbance to existing resources are expected to be outweighed by long-term gains in function. Drought conditions may delay the ability to meet performance criteria.

3.4.4 Implementation Details

Prior to the pool enhancement, the Restoration Biologist will estimate absolute vegetation cover and relative vegetation cover using transects with point intercepts and photo-documentation on four existing reference pools in the VFCL. Additionally, the Restoration Biologist will determine if vernal pool indicator plant species are present in each identified reference pool. Soil type, presence/absence of sensitive species and indicator species, pool complex size, depth, and watershed hydrology will also be documented to determine biological viability for the enhanced pools. This data will be documented and recorded during the reference pools investigations. It is recommended that the reference pools continue to be monitored for comparative purposes during the monitoring period. The data collected on reference pools will provide baseline information that will be used as a comparative tool to determine the success of the pool enhancements.

These pools will be preserved and managed in perpetuity. Total vernal pool enhancement will be 0.05 acre.

3.4.5 Monitoring Objectives, Performance Criteria, and Methods

Monitoring Objectives

To evaluate the success of the vernal pool enhancement during the wet season monitoring period.

Performance Criteria

The performance standards for absolute cover and relative cover by vernal pool indicator plant species in each enhanced pool shall be within 15 percent of the reference pools.

Methods

The methods for monitoring the enhanced vernal pools include:

- Monitoring the structural components of the pool and associated structures. Due to the presence of livestock, which will be allowed to graze in the area of the pool,

there is a possibility that the livestock could damage the pool which may determine the effectiveness of the pool to retain water. Temporary fencing to exclude livestock from grazing may be used to protect the pools at the discretion of the Restoration Biologist. Any damage will have to be repaired outside the rainy season to avoid impacts to plant and animal species. Timing of cattle exclusion will be at the discretion of a qualified biologist and will be focused on protecting the physical integrity of the pools. Grazing may be used within individual pools during the dry period to manage non-native vegetation cover if deemed necessary by a qualified biologist.

- Estimating absolute vegetation cover and relative vegetation cover using transects with point intercepts and photo-documentation at enhanced pools and four existing reference pools in the VFCL annually throughout the five-year monitoring period.
- Tracking rainfall during the rainy season (November through March) within the Project area to determine the rainfall amount for the five-year monitoring period and how this compares to the long-term average.
- Establishing photo points preferably at a distance of approximately 30 m from the pool edge and taking photographs during the rainy season and at the end of the rainy season to document proper seasonal dry-down of the pool. The purpose of photo points would be to assess observable qualitative changes.
- If performance criteria are not met, the biologist will determine if reseeding the same pool or reseeding another pool within the VFCL would be most beneficial for the vernal pool enhancement to ensure thatthe establishment criteria of 0.05 acre will be met).

3.5 GKR Relocation

GKR will be relocated from the Project Footprint in accordance with the attached *Giant Kangaroo Rat Relocation Plan For The Panoche Valley Solar Project* (Appendix F).

4.0 Management Strategy for the Panoche Valley Solar Facility Conservation Lands

This section focuses on the management strategy, including goals and objectives for the Conservation Lands. Conservation Lands are expected to meet the stated conservation goals and objectives through the implementation of appropriate land management, monitoring, and adaptive management measures as described in this HMP.

4.1 General Management Principles

The specific conservation goals and objectives for the Conservation Lands are discussed in Section 4.2 and were developed based on the general management principles described in this section. These principles emphasize sustainability while recognizing larger-scale influences such as climate change. These principles are: (1) Selection, development, and use of appropriate information; (2) Integration of ecosystem- as well as species-focused management; (3) Adaptive management; (4) Threat reduction; and (5) Risk management.

Principles

1. Selection, development, and use of appropriate information: It is insufficient to indicate that "science-based information" will be used to inform management decisions. The determination of what information is relevant and how it applies to management decisions is a nontrivial and ongoing process. In general, management will be informed by principles from all relevant scientific disciplines. This forms the strongest basis for science-based management—using principles that are well-tested and supported by decades of scientific query. Examples of such principles include the importance of genetic diversity for adaptation, addressing negative edge effects, the concept of minimum viable populations, managing for appropriate diversity at all levels (populations, species, etc.), minimization of habitat fragmentation, etc. The scientific literature will be regularly queried for specific additions to the knowledge on species, communities, and processes that comprise the Conservation Lands, but this information will require interpretation and application. The grey literature (generally defined as

unpublished science-based information) may also provide management support but because it is less accessible, it will be important for the Conservation Lands Manager to stay involved with appropriate science and conservation communities so as to be aware of this literature. This connectivity will also assist in acquiring beneficial experience and expertise from others. Finally, management will also be informed by the prior experience of the Conservation Land Manager with similar natural resources and the experience gained over time on-site.

2. Integration of ecosystem- and species-focused management: Management will need to address levels of biodiversity from individuals to ecosystem to achieve long-term conservation goals. Although conservation of particular species is a goal, this unit will not always be the management focus because: (1) the functional units are typically populations (e.g., adaptation), (2) the ecosystem context and processes must be healthy to support the species (e.g., pollinators, prey base, mycorrhizae, seed dispersers, etc.), and situations will occur in which there is competition for biological and/or financial resources by different high-value species. For example, maintenance or enhancement of certain wetland habitats for some species may be at the expense of grassland habitats that are favored by others. However, exclusive focus on maintaining diversity and resilience at the ecosystem level may result in the loss of rare or high-value species. Attention will be directed to populations, species, and ecosystem levels.
3. Adaptive management: This term has been popularized and widely interpreted. Its intended meaning as applied to management of the Conservation Lands is 'the systematic acquisition and application of reliable information to improve management over time' (Wilhere 2002). In general, adaptive management will be best served by practicing management within an experimental frame where possible (i.e., able to parse influences and determine cause and effect). It will involve incorporating new information (whether from experience, literature, new on-site conditions, or regulations) and will require monitoring as a primary information source.

The following excerpt from a Center for Natural Lands Management white paper on this topic (Rogers 2008) provides a general description of the conditions that will support the practice of adaptive management on the Conservation Lands:

(1) Appropriate management structure: Management plans will be updated periodically. This provides both a prompt and an opportunity to revisit the management trajectory and review relevant information as it becomes available.

(2) Management personnel: Conservation Lands management staff will be selected who have a strong background in biological sciences, are comfortable in searching scientific literature and conducting scientifically rigorous field studies, and who have the ability to interact appropriately with the research community for management support.

(3) Sound record-keeping: Just as adaptation in the evolutionary sense depends on inheritance from one generation to another of the trait of interest, so too adaptive management relies on a strong institutional memory that transcends individual managers. Records of management activities, monitoring, and other pertinent information will be maintained in perpetuity and securely on digital media within a securely administered information management system.

(4) Developing long-term relationships with researchers: The expertise needed to guide conservation-directed management is multi-disciplinary and thus management will be well-served by a creating a network of expertise. The Manager will review requests from researchers to use the preserves for on-site research projects using filters that include risks to native species and conservation value of the proposed research. The Manager will also invest in relationships with the research community as an ongoing source of support for decision-making.

(5) Appropriate analysis and interpretation of information gathered from site: Data acquired from monitoring will be framed appropriately such that meaningful information is gained on resident species. For example, the spatial scale of the species' range relative to the species occurrence on the Conservation Lands is an important reference. Similarly, the time scales of the species—lifespan, breeding cycles, etc.—help to determine how long information must be collected before it is biologically meaningful and can be interpreted for management purposes.

(6) Management stability: One of the preconditions identified by Lee (1993) for genuine adaptive management is sufficient (institutional) stability to measure long-term outcomes. Agreements pertaining to responsibility for managing and protecting the Conservation Lands—whether relating to management, or conservation easement compliance (or a combination)—should be in effect in perpetuity. This will provide the necessary stability and timeframe for effective adaptive management.

4. Threat reduction: In general, threats to the Conservation Lands are those actions or influences that could degrade or undermine the conservation values and are generally expected to be those of anthropogenic origin. Such threats could be either direct (e.g., trespass and damage) or indirect (e.g., pollution from an offsite source, human-vectored pathogen transmission). The most appropriate means (physical, educational, regulatory outreach, etc.) will be used to reduce each threat, with resources allocated according to the anticipated threat impact. A preventative approach will be taken where threats can be anticipated anywhere possible. Although threats to individual focal species may sometimes be natural processes (e.g., predation by other native species), the determination of whether this constitutes a threat that requires management action will take into account the estimated scale of impact as well as the interests in maintaining natural processes (e.g., predation as natural selection) and species diversity. Some threats are gradual or cumulative—such as the spread of exotic invasive species—and detection and assessment through long-term monitoring will be critical. Some events or changes—such as wildfire, extreme weather events, or rapid climate change—while possibly posing a threat to conservation values, may also represent 'the new normal' and be best addressed by management actions that generally support natural resilience and adaptation, as they are mostly beyond control by direct management.
5. Risk management: The sensitivity of the conservation values requires that management actions involve little to no risk. Any untested management actions (e.g., first application of pesticides within potential impact zone of listed or sensitive species) will be gradually introduced over time and/or applied initially in

test plots of small areas. As needed, alternative management approaches (e.g., mechanical or chemical weed control) will be compared in test plots for both efficacy as well as safety relative to the conservation values. The safety of the Management staff and public will be high priority. Both the natural and financial resources will be managed with a low-risk approach.

4.2 Specific Conservation Goals and Objectives

The following sections outline the management goals and objectives that will guide the activities undertaken on the Conservation Lands. The conservation goals are the specific guiding principles for the HMP. The objectives provide direction in management in order to meet conservation goals. The purpose of the standards are to guide implementation measures of the HMP such that an adequate and effective conservation program results in long-term benefits to the Covered Species. All Conservation Lands management and monitoring activities will be subject to the stipulations contained in the ESA BO and CESA ITP issued for the Project.

The Conservation Land Manager selected will meet minimum criteria established by CDFW and USFWS for such management entities. The Conservation Land Manager will be equipped and qualified to fulfill or cause to be fulfilled all habitat management and enhancement, species monitoring, reporting and adaptive management tasks associated with management and protection of the Conservation Lands. All management decisions, including those that are not specifically called out in this or other implementation documents, will be made with Covered Species and habitat value as the first priority. Reasoning and decisions will be documented in a way to provide justification for all actions being based on the best available science regarding the Covered Species. If published information is not available regarding a certain action, species and subject matter experts will be consulted if available.

The overall management goal of the Conservation Lands is to maintain viable, self-sustaining populations of the Covered Species within the identified Conservation Lands and, where feasible, enhance the habitat values within the Conservation Lands for SJKF, SJAS, BNLL, GKR, CTS, and other listed species. The standards discussed in the

following sections will be used to determine whether implementation measures contained in the HMP are meeting the management goals and objectives.

Management activities and associated standards that will be implemented on the Conservation Lands are intended to benefit the Covered Species by maintaining and improving habitat values.

There are three main management objectives:

Objective A: Maintain viable, self-sustaining populations of the Covered Species within the identified Conservation Lands.
Objective B: Maintain and increase the habitat value in targeted areas of the Conservation Lands.
Objective C: Provide for measurable means to determine Covered Species status on the Conservation Lands.

4.3 Covered Species Conservation Strategies

The following species-specific conservation strategies are designed to protect existing populations of Covered Species. Most of the Covered Species (GKR, SJKF, SJAS, BNLL) live almost exclusively in upland arid areas (Germano et al. 2011). With the exception of California condor, the remaining Covered Species (CTS, VPFS, LFS, CFS, VPTS) are associated with wetland habitats. The following sections briefly describe the habitat and ecology of each Covered Species and present the conservation strategy for long-term management. Appendix C provides additional information on Covered Species.

4.3.1 Giant kangaroo rat (*Dipodomys ingens*) (GKR) – Federally Endangered, CESA Endangered

GKR can occur in relatively high densities and are relatively easy to monitor using mark-recapture methods. They are also sensitive to changes in habitat structure and are therefore a good gauge of habitat condition and management effectiveness.

The combination of their importance to the community, endangered status, ease of monitoring, and sensitivity to management treatments provide a compelling reason for monitoring GKR populations as part of the long-term management of natural lands. Therefore GKR will be a focal species with respect to management and monitoring in this plan.

Where giant kangaroo rats occur (especially at high density) they often dominate the small mammal community and exclude or reduce populations of other small mammal species (Grinnell 1932; Hawbecker 1944; Hawbecker 1951; Tappe 1941), presumably because of their large size and aggression towards other small mammals (Shaw 1934).

The space encompassing an individual GKR's burrow system is known as a precinct, which is an area of intense use by the animal. A typical precinct has three burrows that are independent of one another and not interconnected (Williams & Kilburn 1991). Precincts are easily spotted in spring due to the denser, lush vegetation compared to the intervening areas (Grinnell 1932, Hawbecker 1944). Plants on a precinct are the first to turn green after autumn rains and the last to ripen and turn brown in the spring (Grinnell 1932; USFWS 1998). Vegetative productivity can be two to five times greater on precincts than on adjacent areas (Hawbecker 1944; Williams et al., 1993). This increased productivity on GKR precincts may be due to their digging and caching activity which reduces soil compaction and increases rain percolation (Hawbecker 1944). Vegetative composition on the precincts can also differ from surrounding areas with a higher proportion of non-natives (Schiffman 1994) as well as an increased density of at least one endangered plant (Cypher 1994). After the annual vegetation dies, the opposite effect occurs as GKR actively clear the vegetation within 2–4 meters of their main burrow so that their precincts are often distinctive circles of short vegetation or bare ground (Bean et al., 2012). When at high densities, GKR can dramatically reduce the amount of herbaceous production (by 1,000 pounds/acre or more) during the late spring and summer through their clipping and burying activities (Carrizo Plain Ecosystem Project 2014; CNLM 2011).

Although the soil disturbance associated with GKR on precincts appears to promote exotic grass cover, their foraging largely limits these grasses to their disturbed mounds and, on a landscape level, actually reduces their abundance and spread (Carrizo Plain Ecosystem Project 2014). This, in turn, may benefit native bunchgrasses. However, other native species (e.g., *Lotus* spp.) and native species cover overall were found to be more abundant in GKR exclusion areas than in areas with abundant GKR (Carrizo Plain Ecosystem Project 2014).

GKR burrows also provide important cover for a myriad of other animals species including reptiles (e.g., BNLL), SJAS, and various invertebrates (Prugh et al. 2012, Tollestrup 1979).

GKR also are prey for numerous predators, including SJKF, barn owl, great horned owl, burrowing owl, short-eared owl, coyote, and American badger (Grinnell 1932, Hawbecker 1943, 1944, 1945; Morell 1972). Snakes that might prey on GKR include coachwhip, gopher snake, common king snake, and western rattlesnake (Williams and Kilburn 1991).

GKR are rightly considered keystone species because of their profound influence on the community (Goldingay et al., 1997; Prugh & Brashares 2012). As mentioned above, they provide an important food source for various predators including kit foxes, owls, snakes, badgers, and weasels. They extensively modify the above-ground habitat by removing a considerable volume of plant biomass each year, creating open space and influencing plant composition. Underground habitat modification is also extensive, providing thermal and hiding cover for various invertebrates, reptiles, and other small animals. With respect to other Covered Species, GKR are thought to benefit kit foxes because they are important prey and leopard lizards because of the creation of burrows used for thermal regulation, cover, and the creation of open space.

Current Distribution on Conservation Lands

GKR are currently found on all three of the Conservation Lands but at varying densities. Recent ground surveys indicate that the proportion of surveyed cells with GKR burrows was highest for SCRCL (0.40) followed by VFCL (0.16) and VRCL (0.02). Distribution

on the Conservation Lands also differs. GKR appear to be widely distributed through most of SCRCL and VFCL, but found in only isolated pockets of VRCL.

Habitat and Life History Traits

GKR inhabit areas of low relief with slopes generally less than 6º (Hawbecker 1951; Williams & Kilburn 1991). Soils associated with GKR colonies are usually sandy loams (Grinnell 1932; Shaw 1934), but they do make use of a variety of soils including heavier clay-based soils in some areas (Williams & Kilburn 1991).

GKR are generally found in heavily grazed areas with limited herbaceous cover (Grinnell 1932, Shaw 1934, Williams 1992). These barren landscapes that often characterize GKR habitat are likely due to heavy grazing pressure from livestock as well as from the digging and clipping activities of GKR.

Early naturalists noted that GKR were found almost exclusively in areas without shrubs (Grinnell 1932; Shaw 1934). However, open areas are not an absolute habitat requirement for GKR (Williams & Kilburn 1991) and GKR have been captured on monitoring plots with up to 18% shrub cover (CNLM unpublished data). However, higher densities are often found in areas with few or no shrubs when compared to nearby shrublands (Williams et al., 1995; CNLM unpublished data). A behavior study by Braun (1985) indicated that GKR spent little or no time foraging under shrubs.

The GKR is primarily a seed eater, but occasionally consumes green plants and insects (Shaw 1934; Grinnell 1932). Foraging takes place year round in all types of weather and can occur anytime from around sunset to near sunrise, and most activity takes place within two hours of sunset. Shortly after the green season, ripening heads of grasses and forbs are cut off and placed in surface piles or haystacks on small surface pits located near the GKR's burrow system. Later, the seeds are moved into underground caches for consumption at a later date. Reported volumes of haystacks generally range from three to five liters, although one exceptionally large haystack was approximately 226 liters in size (Williams 1992; Hawbecker 1944). Less is known of underground caches, but they can range in size from 0.25–4 liters in size (Shaw 1934; Bill Vanherweg personal communication). Curing the seeds is thought to prevent mold growth after the seeds are

moved below ground (Shaw 1934). Thus, sun exposure may be important to ensure that seeds are fully cured. The ability to transport large quantities of seeds in cheek pouches, coupled with the highly developed seed curing and caching behaviors, probably allows GKR to endure prolonged droughts of one or two years without major regional population effects (Williams et al. 1993).

What is known of GKR diet is based largely on descriptive or anecdotal information gathered over a relatively short time period. Shaw (1932) analyzed seed contents within 875 pit caches and found that peppergrass (*Lepidium nitidum*) formed the bulk of the content of pit caches, followed by filaree (*Erodium* sp.). Williams (1992) analyzed eighteen surface piles or *haystacks* and found that the predominant seeds were Arabian grass, red brome, wild annual barley, and peppergrass. Hawbecker (1944) reported that haystacks consisted almost entirely of red brome. In a preference trial on the Carrizo Plain, Olney (2008) found that GKR showed a strong preference for filaree, goldfields (*Lasthenia californica*), and peppergrass during one year. Thus, GKR clearly harvest and consume a variety of non-native and native annual plants. However, food plant preference is difficult to determine because although there are descriptions and anecdotal observations of diet, there is no accompanying information on availability of these plants. Long-term analyses of diet of GKR in relation to vegetation availability would provide important data on food plant preferences which could enable more effective management and conservation of this species.

Optimal habitat – Flat or gently sloping terrain, friable soils, no or sparse shrub cover, limited herbaceous cover. Food plants: Lotus, pepper grass, goldfields, filaree, red brome.

Conservation Strategy

The objective of the conservation strategy for GKR is to permanently protect and enhance habitat for GKR on the Conservation Lands and to relocate GKR displaced as a result of the solar energy facility construction to suitable but unoccupied habitat.

This includes the following measures:

- Permanently protect approximately 24,176 acres from trespass, illegal dumping and rodenticide use, of which 16,576 acres are high conservation value habitat for GKR.
- Maintain much of the currently occupied habitat in a generally open state with few or no shrubs.
- Use livestock grazing to meet herbaceous cover goals.
- Reintroduce GKR displaced as a result of the solar energy facility construction to suitable but unoccupied or historically occupied habitat.
- Monitor abundance of this species in relation to grazing intensity, vegetation (woody and herbaceous cover), and precipitation. Also, where feasible, initiate long-term studies of diet in relation to availability of food plants to determine food plant preferences.

4.3.2 San Joaquin kit fox (*Vulpes macrotis mutica*) Federally Endangered, CESA Threatened

Current Distribution on Conservation Lands

SJKF occur on the Project Footprint, and portions of VFCL and VRCL. SJKF scats located by scat-sniffing dogs and later genetically analyzed indicated that there were at least 22 separate individual SJKF in the area encompassing the Project Footprint, VFCL, and VRCL (11 male and 11 female). Nine individuals were located on both the Project Footprint and Conservation Lands, and 13 individuals were located exclusively on the Conservation Lands. Spotlighting surveys and camera stations were used to detect kit fox on the SCRCL. As on VRCL, SJKF were recorded in variable terrain on SCRCL including flats, hill slopes and ridges.

Habitat and Life History Traits

SJKF tend to be more general with respect to diet and habitat requirements than many of the other Covered Species. This is perhaps best represented by their ability to occupy heavily modified systems such as cities, landfills, military training bases, and heavily developed oilfields (Cypher & Frost 1999; Cypher and Brown 2006 O'Farrell et al., 1987; Spiegel and Small 1996; Zoellick et al., 2002). However, some preferences have

been noted, especially in natural systems. Although they can occupy and den in areas with clay soils (Reese et al., 1992) they are thought to prefer loose-textured soils (Grinnell et al., 1937; Morrell 1972). Dens provide vital escape cover, places for rearing pups, and thermoregulatory and water conservation benefits for SJKF (Grinnell et al., 1937; Golightly 1981; Ralls & White 1995; Seton 1925). This may explain the general preference for friable soils where they can dig their own burrows. However they can enlarge burrows of California ground squirrel and other species and use these as dens (Orloff et al., 1986). SJKF can inhabit fairly steep terrain (Orloff et al., 1986) but they are more consistently found within areas of low relief (Grinnell et al., 1937; Egoscue 1962; Daneke et al., 1984; Warrick & Cypher 1998). There is also evidence that SJKF generally favor open grasslands over shrublands (Nelson et al., 2007; Warrick & Cypher 1998; White et al., 1995). Since SJKF are desert species, it is thought that habitat suitability is highest in areas with relatively low herbaceous cover (Cypher et al., 2013).

SJKF are fairly general and opportunistic in their feeding habits and thus foxes have different prey items depending on location and time period. Primary prey items have included Heteromyid rodents (Cypher et al., 2000; Hawbecker 1943; Morrell 1972; Laughrin 1970; White et al., 1996), lagomorphs (Scrivner et al., 1987), and ground squirrels (Cypher & Warrick 1993; Logan et al., 1992). Insects (especially Orthopterans and Coleopterans) also appear to be an important source of food in some areas and time periods (Briden et al., 1987). SJKF shifted their diet from primarily lagomorphs to primarily kangaroo rats during a 16–year study on the Naval Petroleum Reserves (Cypher et al., 2000). SJKF have also been known to shift their normal activity patterns when diurnal prey (e.g., California ground squirrels) are abundant (O'Farrell et al., 1987). Despite this generally opportunistic and plastic nature regarding diet, there are times when SJKF appear unable to switch to alternate prey when their primary prey declines (White et al., 1996).

Food availability is thought to be the primary factor affecting fluctuations in SJKF abundance (Cypher et al., 2000; White & Garrott 1997). Food resources (especially rodents) in natural areas of the San Joaquin Valley fluctuate greatly (CNLM 2014; Cypher et al. 2000; Williams et al. 1993;Single et al. 1996) and therefore SJKF

populations mirror this dynamic pattern through time (Cypher et al., 2000;White et al., 1996).

Coyotes are a potent source of SJKF mortality in virtually all natural areas where they have been studied (Ralls & White 1995; Cypher et al., 2000; Orloff et al., 1986; Standley et al., 1992). Although coyotes are not thought to be as important a factor in population regulation as food supply, they may dampen population increases and accentuate population declines of SJKF (Cypher & Spencer 1998; White & Garrott 1997). Larger predators also likely affect the spatial distribution of SJKF and may drive the habitat preferences noted above. For example, coyotes have been found to use shrublands proportionately more than open grasslands (Nelson et al., 2007; White et al., 1995) probably due to the cover provided and abundance of their preferred prey (lagomorphs). Bobcats also generally need areas with shrub or topographic cover for shelter and for concealment while stalking and ambushing prey (Lancia et al., 1982; Anderson 1990). In contrast, SJKF have been found to use shrublands less than open grasslands (Nelson et al., 2007; White et al. 1995). Nelson et al., (2007) also found that mortality rates of SJKF were directly related to the amount of shrub habitat in their home ranges. The apparent preference for low relief areas by SJKF, may also be due to abundance of larger predators. SJKF occupied the more rugged topography of the Naval Petroleum Reserves when coyote numbers were unusually low, but virtually disappeared from these areas as coyote numbers increased (Warrick & Cypher 1998). Thus, SJKF abundance and distribution appear to be affected by significant bottom-up and top-down pressures in natural systems. The larger predators in particular may largely drive their apparent preference for relatively flat, open habitats with little structure while prey abundance primarily influences population size within this preferred habitat

Non-native red foxes have been known to kill SJKF and may compete or displace the sensitive species in some areas (Clark et al., 2005; Lewis et al., 1993; Ralls & White 1995). However, because red foxes are not adapted to desert areas and may be limited by free water sources (Clark et al., 2005), they may not be able to colonize much of the occupied range of SJKF and thus may not pose a widespread threat.

Optimal habitat – Generally flat or gently sloping terrain, occasionally on steeper slopes, friable soils, no or sparse shrub cover, limited herbaceous cover, with abundant kangaroo rats or other prey. SJKF tend to be more general with respect to diet and habitat requirements than many of the other Covered Species.

Conservation Strategy

The objective of the conservation strategy for SJKF is to permanently protect and enhance habitat for SJKF on the Conservation Lands. This includes the following measures:

- Permanently protect approximately 24,176 acres of habitat from trespass, illegal dumping and rodenticide use, of which 24,000 acres are high conservation value for SJKF.
- Maintain much of the currently occupied habitat in a generally open state with few or no shrubs.
- Use livestock grazing to meet herbaceous cover objectives for SJKF and their prey.
- Monitor relative abundance of this species through time.

4.3.3 Blunt-nosed leopard lizard (*Gambelia sila*) Federally Endangered, CESA Endangered with Fully Protected Status

Current Distribution on Conservation Lands

A total of 61 observations of BNLL were recorded during surveys of SCRCL in 2012. Observations were widely distributed on the SCRCL and although washes were specifically targeted, numerous observations outside of wash habitats were made incidentally. BNLL were also documented on the VFCL (27 observations) in 2013 and 2014, mostly associated with wash habitat along Panoche Creek. No BNLL have been documented on VRCL.

Habitat and Life History Traits

BNLL are found in relatively flat, sparsely vegetated grassland and shrubland habitat within the San Joaquin Valley and arid valleys of the interior coast ranges (Montanucci 1965). Shrub cover is thought to provide shelter and escape cover but this species was not found in areas with dense shrub cover (Montanucci 1965). Small mammal burrows are often used for shelter from predators and for thermoregulation (Tollestrup 1979). However, they are known to construct shallow burrows at times (Montanucci 1965). BNLL preferentially use open habitat including washes and dirt roads (Warrick et al., 1998). BNLL preference for open habitat may be because dense or tall herbaceous vegetation reduces this species ability to forage and to escape predators (Montanucci 1965). Soil types varies from gravel to hardpan or sandy loam (Montanucci 1965).

BNLL are thought to be opportunistic predators capturing whatever prey is most abundant (Germano et al. 2007). Orthopterans (grasshoppers, crickets), Coleopterans (beetles) and hymenopterans (bees, wasps) are frequent items in their diet with a variety of other arthropods and lizards occasionally taken (Kato et al., 1987; Montanucci 1965; Germano et al 2007; Tollestrup 1979).

Rodent burrows (e.g., kangaroo rat or ground squirrel) may be especially important to BNLL in that they provide important thermal and escape cover. In addition, GKR—through their clipping and digging activities—can dramatically reduce the amount of herbaceous vegetation and thus make the habitat more suitable for species like BNLL that require a relatively open habitat. Prugh and Brashares (2011) found that activity by GKR also increased the abundance of othopterans and coloeopteans, which could in turn benefit BNLL by increasing the density of frequently-consumed prey species.

Known predators of BNLL include San Joaquin coachwhip (*Masticophis flagellum ruddocki*), northern Pacific rattlesnake (*Crotalus viridis oreganus*), gopher snake (*Pituophis catenifer*), prairie falcon (*Falco mexicanus*), American kestrel (*Falco sparverius*), loggerhead shrike (*Lanius ludovicianus*), burrowing owl (*Athene cunicularia*), red-tailed hawk (*Buteo jamaicensis*), and roadrunner (*Geococcyx californianus*) (Germano 2003; Montanucci 1965; Tollestrup 1979). Other predators

thought to prey on BNLL include SJKF, badgers, coyotes, skunks, and other species of snakes and raptors (Montanucci 1965; Tollestrup 1979). Based on the current literature, snakes and raptors may be the most common predators of BNLL. Raptor predation on BNLL may be reduced by limiting the opportunities for nesting and perching sites for these species.

Optimal habitat: flat or gently sloping terrain, low shrub cover, limited herbaceous cover, abundant kangaroo rat burrows, areas of permanently open habitat (e.g., washes, dirt roads) and an abundant and diverse insect prey base.

Conservation Strategy

The objective of the conservation strategy for BNLL is to permanently protect and enhance habitat for BNLL on the Conservation Lands. This includes the following measures:

- Permanently protect approximately 24,176 acres of habitat from trespass, illegal dumping and rodenticide use, of which 11,883 acres are considered high conservation value for BNLL.
- Restore shrub cover in some areas to provide additional thermal and escape cover and to enhance prey diversity for BNLL.
- Use livestock grazing to meet herbaceous cover objectives for BNLL.
- Monitor relative abundance of this species through time.

4.3.4 San Joaquin antelope squirrel (*Ammospermophilus nelsoni*)

Current Distribution on Conservation Lands

During GKR surveys conducted in February 2013, one observation of SJAS was recorded on VRCL and 13 observations were recorded on SCRCL. These observations each represented individual SJAS as they were recorded during a single survey effort. During the BNLL protocol surveys in 2013, five and 15 SJAS observations were recorded on VFCL and VRCL, respectively. Many of these observations were likely the same individual observed multiple times over the survey period.

SJAS were regularly observed on VRCL and SCRCL during surveys conducted in 2009, 2010, and 2012 by Live Oak Associates, Inc. The entire area of the Conservation Lands is considered suitable mitigation for this species. Population density of this species is considered relatively low on the VFCL and the VRCL compared to SCRCL. SJAS were widely distributed at SCRCL and hundreds of observations were recorded during 2010 reconnaissance surveys. Similarly, during a two-week period in September 2012, 119 observations were recorded on SCRCL.

Habitat and Life History Traits

SJAS live in relatively arid grassland and shrubland communities (e.g, *Atriplex* and *Ephedra*) (USFWS 1998). Areas with relatively dense populations of SJAS including the Panoche Area and Carrizo Plain are often described as being heavily grazed with low herbaceous cover (Hawbecker 1947, USFWS 1998). However, it is thought that some areas may not be able to support viable populations of SJAS in the face of continued overgrazing on moderately to severely degraded rangelands (USFWS 1998). SJAS may be most numerous in areas of sparse to moderate cover of shrubs (USFSW 1998). However they can have dense populations in shrubless areas especially in association with kangaroo rats (Harris and Stearns 1991). In the Project Area they are associated with plants such as red brome, red-stemmed filaree, and California ephedra (USFWS 1998). SJAS are predominantly confined to loam and sandy loam soils and they require areas where their burrows are free from flooding (Hawbecker 1947).

SJAS live in burrows that vary in complexity and length, but generally have two to six openings and are between roughly 30 and 50 centimeters (12 to 20 inches) deep. They may live in burrows of their own construction or take over and enlarge those dug by kangaroo rats.

The diet of the SJAS is highly dependent on availability. The SJAS eat green vegetation, fungi, insects and seeds. Vegetation and seeds of filaree and red brome and seeds of shrubs such as ephedra and saltbush are staples. available, grasshoppers are the primary insects consumed. In the absence of seeds and grasshoppers, SJAS will eat harvester ants (Hawbecker 1975). During spring, especially during severe drought, SJAS will eat large

quantities of ovaries and developing seeds of ephedra (D.F. Williams unpublished observation as cited in Recovery Plan (USFWS 1998)).

Predators of the SJAS include hawks, falcons, eagles, snakes, SJKF, coyotes, badgers, and probably other predators (Williams and Tordoff 1988).

Optimal habitat – Gently sloping or rolling terrain, some shrub cover especially *Ephedra* or *Atriplex*, limited herbaceous cover. Food items include *Ephedra*, red brome, filaree, grasshoppers and other arthropods.

Conservation Strategy

The objective of the conservation strategy for SJAS is to permanently protect and enhance habitat for SJAS on the Conservation Lands. This includes the following measures:

- Permanently protect approximately 24,176 acres of habitat from trespass, illegal dumping and rodenticide use.
- Restore shrub cover in some areas to provide additional thermal and escape cover and to enhance prey diversity for antelope squirrels.
- Use livestock grazing to meet herbaceous cover objectives for SJAS.
- Monitor relative abundance of this species through time.

4.3.5 California Tiger Salamander (*Ambystoma californiense*)

Current Distribution on Conservation Lands

There are a total of 12 ponds present on the VFCL and the VRCL and just outside these areas (Figures 12 through 14). Three ponds are offsite, five are within the VRCL, and four are within VFCL. CTS were documented in one offsite pond (Pond #3), one pond on VRCL (Pond #12), and historically documented in two ponds on the VFCL (Ponds #8 and #9). No larvae or adult CTS were detected within the Project Footprint but historically CTS have been documented in the major drainages within the VFCL.

Habitat and Life History Traits

The use of vernal pools and other temporary bodies of water for breeding limits the CTS to areas of low elevation and low topographic relief throughout their range (Stokes et al., 2008). Ephemeral vernal pools which refill with water on a yearly basis are 40 – 80 cm in depth, and have a surface area of 0.2 hectares or more are optimal for breeding CTS, although small, shallower pools will also house breeding CTS (Stokes et al., 2008). Depth of the breeding pool was highly correlated with breeding CTS. Stokes et al., (2008) found no CTS larvae in pools with an average depth of less than 22 cm. Deep pools with permanent water may not be optimal for breeding populations of CTS because they often house predatory fish, crayfish, or bullfrogs that prey upon larval CTS. This creates a narrow range of pool depths where the pool will not completely dry out before CTS have metamorphosed, but also not contain water year-round and house predators. Metamorphosed CTS move out of the vernal pools and into upland habitats. Small mammal burrows are important features of upland habitat. Adult CTS occupy small mammal burrows in grassland, savanna, or open woodland habitats (Trenham and Shaffer 2005).

Activity patterns of adult CTS are not well understood. Adult CTS live their entire lives in the burrows of small mammals such as the California ground squirrel. Adults begin moving toward breeding pools when the first fall rains begin to inundate pools. Breeding adults will continue moving to pools through the winter and spring. Adults can generally be found at breeding pools from October through May, although breeding is highly dependent on the amount of precipitation (Trenham et al., 2001; Trenham and Shaffer 2005). Adult CTS leave the breeding pools in late spring and return to upland habitats. Trenham and Shaffer (2005) used pitfall traps at various intervals away from a pool to determine the extent of upland use. They found that the numbers of adult CTS declined as distance from the pool increased out to 620 meters. Subadults also moved up to 600 meters away from the pools, but most were concentrated between 200 and 600 meters from the pool. This has led managers to suggest preserving upland habitats with suitable small mammal burrows out to 600 meters from breeding pools (Trenham and Shaffer 2005).

Optimal habitat – Areas of low relief with emphemeral vernal pools (≥0.2 ha in size) that fill to 40-80 cm annually. Surrounding upland habitat with numerous rodent burrows.

Conservation Strategy

The objective of the conservation strategy for CTS is to permanently protect and increase habitat for CTS on the Conservation Lands. This includes the following measures:

- Permanently protect at least four potential breeding ponds on the Conservation Lands.
- Permanently protect approximately 4,028 acres of potential estivation habitat on the VRCL and VFCL.
- Permanently protect any potential breeding ponds or estivation habitat on the SCRCL. The current status of CTS on the SCRCL is unknown. No surveys occurred on the SCRCL for CTS; however, at least two manmade ponds support potential habitat.
- Create three breeding ponds on the Conservation Lands. These ponds will be maintained in perpetuity.
- Monitor created CTS pond(s) and surrounding estivation habitat.
- Perpetually preserve created CTS pond(s) and surrounding estivation habitat.

4.3.6 Vernal Pool Fairy Shrimp Federally Threatened

Current Distribution on Conservation Lands

There are no records of VPFS on the Conservation Lands. VPFS were detected in one pond within the former Project Footprint. The pond is now protected as part of VFCL and will not be disturbed during construction.

Habitat and Life History Traits

VPFS were found by Helm (1998) in 21 different types of habitat, including vernal pools, vernal swales, alkaline pools, and road-side ditches. Optimal pools tend to be a neutral to slightly alkaline pH, have low dissolved salts, and are dominated by native vernal pool plants. VPFS can occur in pools as large as 10 hectares (25 acres), but most occur in

much smaller pools measuring less than 0.02 hectares (0.05 acres; Gallagher 1996, Helm 1998). Helms (1998) found the average depth of pools containing VPFS to be 15 cm, with an average maximum depth of 22 cm. The common thread among all types of habitat is that they dry out during the summer and fall. The eggs, or cysts, of VPFS require a drying and inundation cycle to trigger hatching. If the cysts do not dry out, a fungal infection can occur, killing the cyst.

VPFS forage on bacteria, protozoan, algae, rotifers, and bits of detritus. Vernal pool branchiopods in general provide a major foraging source for migrating waterfowl and shorebirds. Mallard (*Anas platyrhynchos*), green-winged teal (*A. crecca*), bufflehead (*Bucephala lbeola*), greater yellowlegs (*Tringa melanoleuca*), and killdeer (*Charadrius vociferus*) all forage actively on vernal pool branchiopods during spring migrations (Yolo Natural Heritage Program 2009). Western spadefoot (*Spea hammondii*) bullfrog (*Lithobates catesbeianus*), mosquitofish (*Gambusia affinis*), and vernal pool tadpole shrimp (*Lepidurus packardi*) also forage on VPFS.

Mobile predators, such as waterfowl and shorebirds, can expel viable cysts in their excrement, thus aiding in the dispersal of VPFS. VPFS also disperse in high water events that can temporarily interconnect adjacent pools.

Optimal habitat – Vernal pools (0.02-10 ha in size) with neutral to slightly alkaline pH, low dissolved salts. Pools should contain abundant food sources such as bacteria, protozoa, algae, and detritus during the inundation period and dry out in the summer for successful hatching.

Conservation Strategy

The objective of the conservation strategy for VPFS is to permanently protect and actively manage habitat for VPFS on the Conservation Lands if it is determined that they are present. This includes the following measures:

- Permanently protect all vernal pool habitat on the Conservation Lands.
- Conduct monitoring to determine hydrology of the vernal pools, whether VPFS are present, and their distribution.

- Manage in perpetuity all existing vernal pool habitat.

4.3.7 Conservancy fairy shrimp (CFS; *Branchinecta conservatio*) Federally Endangered

Current Distribution on Conservation Lands

There are no records of CFS on the Conservation Lands and the site has not been surveyed.

Habitat and Life History Traits

Suitable habitat for the CFS includes vernal pools, alkaline pools, and vernal lakes (Helm 1998). Occupied pools ranged from 30 square meters (m^2) to 356,253 m^2. Occupied pools averaged 27,865 m^2 which is larger than the average pool size of all other endemic California branchiopods. Pool depth ranged from 10 to 40 cm with an average of 23.1 cm. Other habitat characteristics include low alkalinity, low total dissolved solids, a pH near 7, and being dominated by native vernal pool plants (USFWS 2005). The common thread among all types of habitat is that they dry out during the summer and fall. The eggs, or cysts, of VPFS require a drying and inundation cycle to trigger hatching. If the cysts do not dry out, a fungal infection can occur, killing the cyst.

CFS forage on bacteria, protozoan, algae, rotifers, and bits of detritus. Vernal pool branchiopods in general provide a major foraging source for migrating waterfowl and shorebirds. Mallard, green-winged teal, bufflehead, greater yellowlegs, and killdeer all forage actively on vernal pool branchiopods during spring migrations (Yolo Natural Heritage Program 2009). Western spadefoot, bullfrog, mosquitofish, and vernal pool tadpole shrimp also forage on CFS.

Mobile predators, such as waterfowl and shorebirds, can expel viable cysts in their excrement, thus aiding in the dispersal of CFS. The CFS also disperse in high water events which can temporarily interconnect adjacent pools.

Optimal habitat – Vernal pools with low alkalinity, pH near 7, low dissolved salts. Pools should contain abundant food sources such as bacteria, protozoa, algae, and detritus during the inundation period and dry out in the summer for successful hatching.

Conservation Strategy

The objective of the conservation strategy for CFS is to permanently protect and actively manage habitat for CFS on the Conservation Lands if it is determined that they are present. This includes the following measures:

- Permanently protect all vernal pool habitat on the Conservation Lands.
- Conduct monitoring to determine hydrology of the vernal pools, whether CFS are present, and their distribution.

4.3.8 Longhorn fairy shrimp (LHFS; *Branchinecta longiantenna*) Federally Endangered

Current Distribution on Conservation Lands

There are no records of LHFS on the Conservation Lands.

Helm (1998) surveyed 4,008 vernal pools, and similar habitats, for fairy shrimp. Only four pools contained LHFS. Habitat that contained LHFS in Helm's study included alkaline pools and rock outcrop pools. Pools which contained LHFS ranged from 4.6 to 2,788 m^2 and averaged 678 m^2. Pool depths ranged from 10 to 40 cm and averaged 23.1 cm. Other characteristics of pools with extant populations include a pH near neutral, and temperatures ranging from 10 to 28˚ C. The common thread among all types of habitat is that they dry out during the summer and fall. The eggs, or cysts, of VPFS require a drying and inundation cycle to trigger hatching. If the cysts do not dry out, a fungal infection can occur, killing the cyst.

LHFS forage on bacteria, protozoa, algae, rotifers, and bits of detritus. Vernal pool branchiopods in general provide a major foraging source for migrating waterfowl and shorebirds. Mallard, green-winged teal, bufflehead, greater yellowlegs, and killdeer all forage actively on vernal pool branchiopods during spring migrations (Yolo Natural Heritage Program 2009). Western spadefoot, bullfrog, mosquitofish, and vernal pool tadpole shrimp also forage on LHFS.

Mobile predators, such as waterfowl and shorebirds, can expel viable cysts in their excrement, thus aiding in the dispersal of LHFS. LHFS also disperse in high water events that can temporarily interconnect adjacent pools.

Optimal habitat – Alkaline vernal pools with a pH near 7. Pools should contain abundant food sources such as bacteria, protozoa, algae, and detritus during the inundation period and dry out in the summer for successful hatching.

Conservation Strategy

The objective of the conservation strategy for LHFS is to permanently protect and actively manage habitat for LHFS on the Conservation Lands if it is determined that they are present. This includes the following measures:

- Permanently protect all vernal pool habitat on the Conservation Lands.
- Conduct monitoring to determine hydrology of the vernal pools, whether LHFS are present, and their distribution.
- Manage in perpetuity all existing vernal pool habitat.

4.3.9 Vernal pool tadpole shrimp (VTPS; *Lepidurus packardi*) Federally Endangered

Current Distribution on Conservation Lands

There are no records of VPTS on the Conservation Lands.

Habitat and Life History Traits

Helm (1998) found VPTS in 17 different types of habitat, including alkaline pools, vernal pools, vernal swales, ditches, road ruts, and stock ponds. Average occupied pool size was 1,828 m^2. Occupied pool depth ranged from two to 151 cm, with an average of 15.2 cm. Optimal pools are neutral to slightly alkaline, clear, low in dissolved solids, and dominated by native vernal pool plants. The common feature among all types of habitat is that they dry out during the summer and fall. The VPTS was able to withstand water temperature as high as 32˚C, and only died when their pools dried. The eggs, or cysts, of VPFS require a drying and inundation cycle to trigger hatching. If the cysts do not dry

out, a fungal infection can occur, killing the cyst. However, cysts can hatch during the wet season without the pool drying out.

VPTS are omnivorous with a strong preference for animal matter. Live invertebrates, amphibian larvae, carrion, and detritus filtered from the water column make up the VPTS diet.

Vernal pool branchiopods in general provide a major foraging source for migrating waterfowl and shorebirds. Mallard, green-winged teal, bufflehead, greater yellowlegs, and killdeer all forage actively on vernal pool branchiopods during spring migrations (Yolo Natural Heritage Program 2009). Western spadefoot, bullfrog, and mosquitofish also forage on VPTS.

Mobile predators, such as waterfowl and shorebirds, can expel viable cysts in their excrement, thus aiding in the dispersal of VPTS. VPTS may also disperse in high water events which can temporarily interconnect adjacent pools.

Optimal habitat: Neutral to slightly alkaline vernal pools, clear, low in dissolved solids, and dominated by native vernal pool plants. Pools should contain abundant food sources such as invertebrates, amphibian larvae, carrion, and detritus during the inundation period and dry out in the summer for successful hatching.

Conservation Strategy

The objective of the conservation strategy for VPTS is to permanently protect and actively manage habitat for VPTS on the Conservation Lands if it is determined that they are present. This includes the following measures:

- Permanently protect all vernal pool habitat on the Conservation Lands.
- Conduct monitoring to determine hydrology of the vernal pools, whether VPTS are present, and their distribution.
- Manage in perpetuity all existing vernal pool habitat.

4.3.10 California Condor (*Gymnogyps californianus*) Federally Endangered, CESA Endangered and Fully Protected

Current Distribution on Conservation Lands

No CACOs were observed in or near the Conservation Lands during any surveys, though USFWS radio-tracking efforts have recorded CACO over the vicinity of the Conservation Lands in the past.

Habitat and Life History Traits

CACO live in rocky shrubland, coniferous forests, and oak savannas (Birdlife International 2013). Individual birds have a huge range and have been known to travel up to 250 km (150 mi) in search of carrion. The birds prefer the carcasses of large dead animals like deer, cattle, and sheep, but have been known to eat the carcasses of smaller animals like rodents and rabbits. CACO begin to look for a mate when they reach sexual maturity at the age of six. The pair makes a simple nest in caves or on cliff clefts, especially ones with nearby roosting trees and open spaces for landing. A mated female lays one bluish-white egg every other year. Eggs are laid as early as January to as late as April. If the chick or egg is lost or removed, the parents will "double clutch". The eggs hatch after 53 to 60 days of incubation by both parents. Chicks are born with their eyes open and sometimes can take up to a week to leave the shell completely. They are able to fly after five to six months, but continue to roost and forage with their parents until they are in their second year. Ravens are the main predatory threat to condor eggs, while golden eagles and bears are potential predators of condor offspring.

Habitat – Optimal habitat: Foraging habitat is variable, but should contain a source of large mammal carrion.

Conservation Strategy

The objective of the conservation strategy for CACO is to permanently protect foraging habitat for CACO on the Conservation Lands. This includes the following measures:

- Permanently protect all habitat on the Conservation Lands.

- Leave dead livestock on-site to provide a source of carrion (with caveats). Livestock would be removed if they present a health risk to humans, livestock, or other Covered Species.

4.4 Habitat Overlap and Preferences Among Covered Species

As expected, habitat requirements and preferences for the Covered Species overlap in some areas and differ in others (Table 4). Terrain and soil preferences are generally similar with friable soils in areas of low relief being preferred by most species. The exception being soils with the wetland species, which need less permeable soils for breeding and estivation habitat. Even so, these breeding and estivation habitats are small in size and restricted to the areas of relatively low relief. This has relevance in that much of the management for the Covered Species can be focused on the flatter terrain, although SJKF, SJAS, and GKR have been shown to use steeper terrain. The steeper upper portions also are important as they form portions of the watershed, but management in these areas will be less intensive and mostly focus on maintaining the natural ecological processes and function in these areas. There is also widespread consistency with regards to herbaceous vegetation with most species preferring low vegetative cover and height. Diet preferences, as expected, differ because of the different trophic levels represented, but there are some consistencies with certain annual species of plants (e.g., *Erodium*, *Bromus*) being important food plants for the herbivore/granivores and grasshoppers and other insects being staples for BNLL and SJAS as well as being occasionally important for SJKF.

Woody cover preferences do appear to differ somewhat with some species preferring an open habitat whereas others may benefit from shrub cover. Fortunately, the Conservation Lands are of considerable size and therefore maintaining a mosaic of open grassland and low-density shrubland appropriately scaled according to home range size is feasible. Also, these preferences do not appear to be absolute, with GKR and SJKF able to occupy shrublands in some situations and all the desert species appear able to maintain viable populations in open grassland.

CACO differs from the other species in that it is far ranging and will likely only use the area for foraging since no nesting habitat is available on-site. Because it forages almost exclusively on carrion (USFWS 1996), maintaining the potential for this source of food on-site will be the main management objective for this species.

Table 4. Preferred habitat and diet preferences by Covered Species.

Common Name *Scientific Name*	Terrain	Soils	Herbaceous Vegetation	Woody Cover	Diet or Other Preferences
Giant kangaroo rat *Dipodomys ingens*	Low relief	Sandy loam	Low	Low or no shrub cover	Lepidium, Erodium, Bromus madritensis thought to be important
San Joaquin kit fox *Vulpes macrotis mutica*	Low relief	Loose-textured	Low	Low or no shrub cover	Generally rodents (especially kangaroo rats), but wide variety of other rodents, leporids, insects.
Blunt-nosed leopard lizard *Gambelia sila*	Low relief	NA	Low	Some shrub cover may be beneficial	Grasshoppers and other arthropods, smaller lizards
San Joaquin antelope squirrel *Ammospermophilus nelson*	Low relief or rolling hills	Sandy loam	Low	Some shrub cover may be beneficial, especially during droughts	Erodium, *Bromus madritensis*, Ephedra, Trifoium, grasshoppers and other arthropods thought to be important.
California tiger salamander *Ambystoma californiense*	Various including flat lands or foothills and upland terrain	NA	Low	None	Limited food intake for adults

Common Name *Scientific Name*	Terrain	Soils	Herbaceous Vegetation	Woody Cover	Diet or Other Preferences
Vernal pool branchiopods *Branchinecta lynchi* and possibly *B. longiantenna*, *B. conservatio*, and *Lepidurus packardi*	Low relief	NA	Native vernal pool vegetation	None	Generally bacteria, protozoa, algae, and detritus.
California condor *Gymnogyps californianus*	Foraging-No preference	NA			Carrion, especially large mammals

5.0 Management Implementation

5.1 Background

While the management principles for this management plan have been outlined in Section 4, this section provides rationale for the specific management techniques as well as site-specific tasks and standards. Covered Species within the Panoche Valley have persisted for decades under current land uses and until new information demonstrates otherwise land uses such as grazing will be continued on the Conservation Lands. The goal is to maintain optimal vegetative conditions for Covered Species while maintaining well functioning ecosystem-level processes. The following discussion includes rationale and descriptions of widespread tasks such as vegetation management and access control as well as more intensive and spatially-focused tasks such as habitat restoration and translocation. Later specific tasks and standards are applied to each of the three conservation areas.

5.2 Vegetation Management

5.2.1 Manage For Herbaceous Structure

Because of the overlap with the Covered Species preferring low herbaceous vegetation (Table 4), this area will be a major target for management. Given the size of the Conservation Lands, most vegetation management will best be accomplished through extensive means such as livestock grazing.

Action – Implement Grazing Management Measures

Rationale – Grazing is the recommended means to maintain low herbaceous cover over large areas. The Panoche area is the northern limit for many of the Covered Species and grazing or some other type of vegetation management may be especially important to facilitate desert-like vegetation conditions. In the absence of heavy livestock grazing (especially in wet periods) the resulting vegetative production may make the habitat unsuitable for Covered Species. Grazing has been identified as beneficial during wet periods for some of these species at the Lokern Natural Area (Germano et al. 2012)—an area that receives roughly half the annual rainfall as Panoche. Grazing will also have the added benefit of reducing fire hazards in the area. Dry herbaceous vegetation is easily ignited and can swiftly carry fire across the landscape especially between April and October. By reducing these light fuels, fire spread rates are reduced and more easily controlled.

Risks/Challenges – Viable populations of Covered Species have persisted for many decades under current grazing conditions; sudden, large-scale or radical changes in management would be unnecessarily risky. Instead, changes to the current grazing regime will be relatively minor, incremental, and well-monitored.

Implementation Details – Livestock (cattle, sheep, horses, etc.) will continue to graze on the Conservation Lands, however, the grazing approach will seek to maximize benefits to the Covered Species and their habitat. To ensure that grazing practices will be managed to benefit the Covered Species the applicable standards and guidelines included in the BLM's Central California Standards for Rangeland Health and Guidelines for Livestock

Grazing (1999) (Standards and Guidelines) shall be incorporated into this HMP. Managing for desert-like habitat will have to be balanced with adequate rangeland health measures (such as soil protection, drought contingencies) in place so that ecosystem processes will continue to function appropriately. Grazing to meet management objectives will also have to be economically viable so that livestock operators will be willing to graze under the established conditions.

Livestock type – Historic accounts indicate that the Panoche area has been intensively grazed by both sheep and cattle. Today, most of flatter terrain is grazed by cattle, but seasonal sheep grazing is allowed by BLM in the Panoche Hills (Stacey Schmidt, personal communication). Sheep have some advantages over cattle in that fences are not needed and they are well suited for steeper terrain. Sheep are typically only grazed during the green season which could be positive or negative depending on how much forage reduction is needed. Cattle can be allowed to graze year-round and are typically better at controlling herbaceous vegetation and shrub cover.

Livestock class – This will be largely up to the operator, but a stocker operation (yearling steers and heifers) may provide the most flexibility. Under this scenario, stocker cattle would be purchased each year and then removed to a feedlot, sold, or moved to another pasture or range when residual dry matter (RDM) levels objectives have been met. Such an operation would provide considerable flexibility in terms of meeting range management objectives.

RDM targets by slope and vegetation type – California annual rangelands are typically managed for RDM. RDM is the amount of herbaceous plant material remaining at the end of the grazing season. This residue acts as a mulch which provides some protection from soil erosion and nutrient losses and provides a suitable germination environment for annuals. The amount of RDM influences herbaceous species composition (George et al. 2001) and habitat suitability for desert species (Germano et al. 2012).

Managing RDM levels in areas occupied by GKR is challenging because GKR (at high densities) can remove or bury substantial amounts of vegetative material over the summer months. Although clipping and caching is an important source of this removal, substantial

amounts may be removed through their digging activities. Studies at the Lokern Preserve in June of 2011 found that vegetation was buried by about 2–4 inches of soil as a result of GKR digging activities. So, even without livestock grazing, during some years, GKR may reduce RDM levels to below the minimum suggested levels during the summer months. Therefore, RDM target levels will be assessed in May or June as opposed to the traditional fall time period. This will provide a better measure of livestock use than in the fall when use by livestock may be confounded by GKR effects on the landscape.

Because of GKR's ability to significantly modify RDM and bare ground levels, it is possible that grazing may not be needed in areas with high GKR abundance. However, the close association between GKR and heavy livestock grazing noted by many authors indicates that grazing may have a positive effect. In the spirit of making few changes to current land uses which have allowed for robust, viable populations of Covered Species, grazing will continue on the Conservation Lands for the foreseeable future.

Because the Conservation Lands have historically been heavily grazed and many of the Covered Species are desert adapted, RDM targets near the minimum suggested for soil protection are recommended (at least for the flatter terrain). As stated previously, this terrain has the highest density of Covered Species which have persisted for decades (if not longer) under grazing pressure. Therefore it is important to not make substantial changes in management. This terrain also is less subject to erosion than steeper areas and therefore there is less need for soil protection and thus a lower RDM level is acceptable from a rangeland health perspective. Bartolome et al. (2006) suggests minimum RDM levels (pounds/acre) of 300 on slopes of 0–10%, 400 on slopes of 10–20%, 500 on slopes of 20–40% and 600 on slopes greater than 40%. The first two slope classes are expected to cover most of the area inhabited by Covered Species and therefore a minimum RDM level of 350 pounds per acre is recommended in these areas. Since the RDM levels are expected to decline over the summer months, a buffer of 150 pounds/acre is added, bringing the RDM target in May/June to 500 pounds/acre which is consistent with that used in a study of the effects of grazing on many of these same Covered Species (Germano et al. 2011). Mulch management requirements established by BLM are similar, but generally less than those referenced above for Annual Grassland.

Although a target RDM of 500 lbs/acre will be managed for, in reality, grazing pressure is rarely uniform across the landscape and will include areas with more and areas with less than this amount, thereby creating a desirable mosaic of vegetation heights and densities.

Turnout criteria/range readiness – Turnout of livestock into a pasture will be allowed when RDM levels are at least 700 lbs/acre or 500 lbs/acre with at least 2 inches of new growth (following BLM Bakersfield guidelines for areas with listed species).

Vernal pools – The vernal pools within the Conservation Lands have experienced grazing over many decades. This important vegetation management tool can be used to control non-native annual grasses and other invasive plant species. Without vegetation management, non-native species can invade vernal pools, competing with native species and altering the hydrology of the pools. The primary management tool for the vernal pool habitat on the Conservation Lands will be through vegetation management activities such as grazing. Invasive plant species will be controlled as necessary. See Section 5.3.1 for more details regarding invasive plant species control.

5.2.2 Manage Woody Cover

Action – Increase Shrub Cover in Designated Areas

Rationale – Perennial shrubs can enhance the overall ecological health of the Conservation Lands by increasing diversity and helping to protect soil resources. Perennial shrub species have more established root systems than annual species and help hold the soil in place. Shrubs provide cover for BNLL and SJAS and may enhance habitat quality. *Atriplex* and *Ephedra* also are known food plants for SJAS and may have increased importance during years when annual plants fail to germinate, as is the case for Mohave ground squirrel, another state-listed species (Lietner & Lietner 1998).

Risks/Challenges – Establishing warm-season perennial shrubs in regions such as Panoche Valley is complicated by competition with fast-growing annual plants, seed predation and browsing by rodents, and lack of late-season rainfall in many years. Satisfactory conditions for recruitment and survival of seedlings are rare, but can occur

during years of low rainfall or immediately after a drought when small mammal populations and annual cover is reduced. A drought year(s) followed by late-season rains in March/April is ideal for saltbush recruitment. Because this level of precision in long-term weather forecasting is not possible, the best strategy is often to seed in most years with the hope that conditions will be suitable for recruitment in some years. Wet years can be seeded as well, but application of broad-spectrum herbicides will likely be needed to control annual plants. If applied around January, good control of annuals can be achieved before saltbush has germinated, thereby reducing competition between the slow-growing perennial shrub seedlings and the rapidly growing annual plants.

Because some of the Covered Species differ in shrub cover requirements with SJKF and GKR generally preferring more open areas and SJAS and BNLL possibly benefiting from shrub cover, a landscape with a mosaic of open and low-density shrublands is recommended. Shrub cover targets in shrublands will generally be in the 1–10% range in relatively flat terrain. Higher shrub cover goals will be established in the steeper terrain as this terrain is generally not preferred by the two species that do best in open habitats. Establishing shrubs alongside washes would be a way to leverage their use by both BNLL and SJAS as both species are thought to prefer these areas (Best et al.1990; Warrick et al. 1998).

Implementation Details – The majority of the habitat within the Conservation Lands is currently open grassland, and creating a mosaic of habitat types will require establishing low-density saltbush stands in some areas. This may require restricting grazing through temporary fencing (e.g., electric) in some areas until the shrubs are established and of good size . This habitat enhancement (shrub establishment) should be phased in an effort to not change the character of the Conservation Lands too quickly. Establishing shrub patches and stringers along washes and roads and allowing for natural regeneration to expand the coverage is recommended. Shrub cover should be managed for the target cover, density, and distribution and tools such as prescribed fire or year-round grazing can be used as needed to decrease shrub cover and maintain the desired mix of habitat types.

Shrub establishment will be accomplished using low-impact and economical methods. Seed will be collected on-site, froman adjacent land, or from a local vendor. The ground will be prepared for seeding by pulling a spike-tooth harrow (5 feet wide) behind a four-wheel-drive pickup or ATV. Saltbush seed will then be hand broadcasted over the harrowed area at a rate of approximately 30 pounds per acre. After seeding, the area will again be harrowed to lightly cover the broadcast seed with soil. If the ground is compacted, two to five passes with the harrow will be made before and after seeding. Once a good crop of seedlings has germinated it will be protected from livestock trampling and browsing by temporary fencing (e.g., electric).

Riparian areas – Riparian areas are generally degraded from continuous livestock grazing with either no woody cover or widely spaced cottonwood trees in a savanna-like structure. Pristine riparian areas in the Panoche Valley region were once probably more thickly wooded than today with stands of cottonwood, sycamore, willows and a heavier understory. These areas are in sharp contrast with the open sparsely vegetated areas that characterize the habitat of several Covered Species that are desert adapted and therefore pose a challenge for management. On one hand, heavily wooded riparian areas add considerable diversity to the system and help with erosion control. However, they are probably unsuitable habitat for desert species and may serve to restrict movements,gene flow, and may even serve as population sinks for some species. For example, hundreds of SJKF occupy the city of Bakersfield, but generally avoid the natural riparian areas along the Kern River where they are often killed by larger predators. Shaughnessy (2003) found that the closely related swift fox (*Vulpes velox*) also avoided riparian areas and other areas with high coyote detection rates. Increased tree cover and structure may also harbor more raptors which could prey on covered rodent species and BNLL. In addition, thickly wooded riparian areas (depending on location and extent) could be a barrier to movement for desert species. For example, Panoche Creek runs basically east/west through the Conservation Lands and if thickly wooded, could restrict movement and gene flow from SCRCL to the VFCL and VRCL to the north. Therefore large changes in riparian structure are not recommended because of the attendant risks for desert species. Instead, the riparian areas will be managed to maintain a mosaic of open cottonwood savanna (current state) with interspersed denser stands.

5.2.3 Wetlands Management

Action- Management of Vegetation and Hydrology in CTS breeding ponds

Rationale – To be desirable for CTS breeding, ponds will be managed to have minimal to moderate levels of emergent vegetation (Ford et al. 2013). Having a diversity of microhabitats, including depths ranging from shallow to deep, spatial distribution and abundant diversity of submerged and emergent vegetation, and temperature ranges can be helpful in creating optimal CTS habitat for various life stages and predator avoidance areas (Ford et al. 2013).

Risks/Challenges – Over time, emergent vegetation can dominate a pond, increasing siltation and changing the hydrology of the pond. The ponds will be managed (e.g., through cattle grazing) to have a mosaic of habitats and over abundance of emergent vegetation will be addressed if found to decrease the habitat for CTS. Abundant submerged vegetation will not be removed because it can help in reducing predation. Invasive plant species will be controlled as necessary (see Section 5.3.1 for more details regarding invasive plant species control).

Implementation Details – The ponds will be at least partially grazed to control vegetation and create turbidity to reduce predation on CTS. Therefore, the ponds will be managed to have a mosaic of habitats.

5.3 Invasive Species Control

The Conservation Land Manager will implement control measures (e.g. selective herbicide) to reduce the extent of tamarisk and other invasive plants rated as "high" by the California Invasive Plant Council for which effective eradication methods have been established. In addition, should Covered Species monitoring indicate that feral pig habitat damage is negatively affecting Conservation Lands directly or through habitat impacts, the Conservation Land Manager will consult with CDFW to establish feral pig control measures on Conservation Lands. Any such program will be subject to all take avoidance and minimization measures contained in this HMP and any additional measures deemed

necessary to adequately protect Covered Species (e.g., timing, general location of activities, etc.).

5.3.1 Plants

Action- Control invasive plant species that are identified as a threat or potential threat to Covered Species

Rationale – Invasive plants have disrupted ecosystems by outcompeting native plant species and changing the habitat structure and function in many natural areas. The Panoche area is no exception with non-native annual species being the dominant annual species in many years. Non-native grasses in particular may have substantially changed the character and structure of the habitat from what it was before European contact.

Risks/Challenges – Certain non-native species (e.g., filaree, red brome) are so abundant that eradication is not feasible. Such a task, even if it was reasonably possible, would be risky in that it would be cause a substantial change to current conditions and would eliminate at least two possibly important food plants for GKR and SJAS.

Implementation Details –Non-native species such as filaree, red brome and other naturalized non-natives will not be targeted for intensive control, but rather broad-scale tools such as cattle grazing will be used to manage for an appropriate habitat structure. Most of the intensive invasive species control will be directed towards newly arrived non-natives and exotics that are clearly detrimental to the system and have more localized distributions.

If newly arrived or newly discovered invasive plant species are observed within the Conservation Lands that are considered detrimental to the conservation values, measures will be taken to control those populations. Any new invasive plant species observed during all other biological surveys will be noted. If observed, those new populations will be mapped and a control plan will be developed. Measures such as manual removal, targeted grazing, mowing, or pesticide use could be used, among others. If pesticide use is determined to be the most effective control method, a Pesticide Control Advisor (PCA) and the appropriate regulatory agencies will be consulted to determine the most effective

and least impactful method to treat the Conservation Lands. Pesticides will only be applied by a licensed applicator who is familiar with using pesticides in these habitat types and in the vicinity of sensitive species and habitats. Pesticides will only be applied using EPA-approved products and in a manner that is consistent with the labels.

5.3.2 Animals

Action – Control non-native and/or feral animal populations that are identified as a threat or potential threat to Covered Species.

Rationale – Like exotic plants, non-native animals can also disrupt ecosystems and in some cases cause the extinction of native species (Vitousek 1990; Hobbs & Huenneke 1992). Feral animals are not known to be a clear threat to the Panoche area ecosystem at this time, but species such as feral pigs and bullfrogs could cause problems in the future. Feral pigs have been found on portions of Silver Creek Ranch (author observation) and are abundant in the adjacent Diablo Range. Feral pigs typically increase soil disturbance and facilitate colonization by non-native species through their rooting activities (Hall Cushman et al. 2004) and thereby alter the composition of the vegetative community. Bullfrogs are known to be a significant predator of CTS larvae (Trenham & Shaffer 2005; USFWS 2010; Ford et al. 2013). Pools with permanent water are not optimal for breeding of CTS because bullfrogs can get established and predate heavily on CTS (USFWS 2010; Ford et al. 2013). Seasonal ponds that dry out during a portion of the year decrease the chances of bullfrogs establishing populations in these ponds.

Risks/Challenges – Feral pigs can be controlled by various lethal trapping and hunting methods, but eradication in areas other than island settings is virtually impossible.

Implementation Details – Although feral pigs do not appear to be a threat to the community at this time, a contingency plan for controlling their numbers should be developed, should they become a problem. This plan includes leaving provisions in the Conservation Easement for hunting or trapping for management purposes and some funds for trapping equipment and labor.

Bullfrogs have not been noted on the Conservation Lands but will be noted if present during larval surveys for CTS within existing and created pond(s). If it is determined that bullfrogs or non-native fish are present within a pond, that pond will be monitored to ensure that it dries out sufficiently during the dry season. Additional measures will be implemented if the pond is still inundated during August. The pond will be drained by pumping for approximately two to three weeks in late August to early September. Completely draining at this time of year will kill any bullfrog tadpoles or fish, but will avoid impacts to CTS larvae. Once the pond is dry, it will be allowed to refill through natural processes. All necessary permits and consultation with the regulatory agencies will be completed prior to implementing this activity. Through this consultation, the most effective means of draining the pond while minimizing the impact on listed species will be determined.

5.4 General Land Protection Measures

The Conservation Land Manager will provide and/or contract all equipment and personnel necessary to maintain fencing, access, operations, and other management activities on the Conservation Lands.

5.4.1 Access Control/Site Security

Action – Restrict access to the site by the public

Rationale – Access control is important in preventing or curtailing a variety of threats (off-road vehicle use, trespass grazing, wildfire, vandalism) to the Conservation Lands. Patrolling in combination with proper signs and fencing is expected to prevent or lessen any illegal or inappropriate activities by the public.

Risks/Challenges – The Conservation Lands are a large area and restricting access to its various boundaries and areas will be challenging. Fencing and signage will deter trespass but may not restrict access.

Implementation Details – At a minimum, Conservation Lands shall be surrounded by fencing that prohibits access that could impact Covered Species, outside of the activities

described in this HMP. Perimeter fencing may be inclusive of adjacent lands if consistent management activities are implemented within all such pastures. All gates shall be locked and all public roads shall include signage at an interval of no less than 500 feet. The managing entity will have personnel on-site during much of the year conducting field tasks, but some patrolling will be needed during the winter months and at other times of limited field work. Signs will be placed along the boundaries of the Conservation Lands, especially along major roads and entryways. The Conservation Land Manager will also conduct public outreach to local schools and media to foster appreciation of the Conservation Lands and the habitat and species therein. Barbed wire fencing and locked gates will be maintained along the border between the Conservation Lands and adjacent private lands. In areas where the Conservation Lands are adjacent and contiguous with BLM pastures, no additional fence will be constructed or maintained. Incidents of trespass and other security issues shall be reported to USFWS and CDFW at least annually.

5.4.2 Debris Removal

Action –Litter and illegal dumping debris will be removed from the Conservation Lands.

Rationale – Litter and dumping areas can lead to an accumulation of material that can be harmful to Covered Species and their habitat.

Risks/Challenges – The Conservation Lands are large and identification of illegal dumping areas may take time to be discovered. General litter will require constant upkeep to be manageable.

Implementation Details – During site visits, the Conservation Land Manager will pick up trash and other debris or record the location of such debris so that it can be picked up at a later date.

5.5 Site-Specific Management Objectives and Actions

5.5.1 Valadeao Ranch

Summary of Current Conditions

As described previously, the VRCL are contiguous with the Project Footprint directly to the west, east, and northeast of the site (Figures 2 and 4). These lands are also contiguous with the VFCL and SCRCL. VRCL also includes several seasonal drainages. The property is dominated by Annual Grassland (approximately 6,700 acres) and ephedra shrubland (approximately 2,700 acres), and also supports Saltbush Shrubland, and smaller amounts of Juniper and Oak Woodlands. Soils on this site are complex and range from sandy to sandy loam to clay loam to badlands. The VRCL contain approximately 3,013 acres with slopes between 0 and 11% (range of slope gradient that defines one parameter of highly suitable habitat for several of the T&E species discussed in this document). Elevations on the VRCL range from approximately 1,400 feet to 2,100 feet above mean sea level (amsl).

T&E species observed (either directly or by their sign) on the VRCL include CTS, SJAS, GKR, and SJKF. Portions of the VRCL were found to be suitable for BNLL, SJAS, GKR, CTS, and SJKF in differing acreage amounts. The VRCL also support one known CTS breeding pond and estivation habitat for an additional known CTS breeding pond located on private land. This breeding pond and estivation habitat for both ponds will be preserved in perpetuity and will increase the mitigation value for CTS.

There are vernal pools within the VRCL that are potential habitat for listed vernal pool branchiopod species such as VPFS, CFS, LHFS, and VPTS. As part of the overall conservation strategy, these pools will be protected and managed in perpetuity.

Management objectives and tasks for the VRCL are summarized in Table 5.

5.5.2 Valley Floor Conservation Land

The VFCL encompass approximately 2,523 acres that are contiguous with the Project Site (Figures 2 and 3). These lands include several seasonal drainages and all of Panoche Creek that lies within the Project Site boundary, which is usually a deep-cut dry wash for most of the year, as well as the 100-year floodplain that bisects the Project site in two places. The VFCL provides corridors or landscape linkages for all of the T&E Species across the valley floor. These lands are comprised of mostly Annual Grassland habitat

with smaller areas of wash/drainage and vernal pool and pond habitat. This area is generally flat with slopes less than 11%.

There are four ponds within the VFCL. CTS were historically documented at two of these ponds (Ponds #8 and #9). As part of the conservation strategy, they will be protected and managed in perpetuity. Historically CTS have been documented in the major drainages within the VFCL. Suitable estivation habitat is considered grasslands within 6,336 feet of breeding ponds.

Other T&E species observed (either directly or by their sign) on the VFCL include GKR, SJKF, SJAS and BNLL. Portions of the VFCL were found to be suitable for CTS.

There are vernal pools within the VFCL that are potential for listed vernal pool branchiopod species such as VPFS, CFS, LHFS, and VPTS. As part of the overall conservation strategy, these pools will be protected and managed in perpetuity.

Management objectives and tasks for the VFCL are summarized in Table 6.

Table 5. Management and Monitoring Objectives and Tasks for Valadeao Ranch Conservation Land

Metric	Objective	Tasks
Structure of herbaceous vegetation	*Objective 1:* Maintain relatively low herbaceous biomass to provide suitable habitat for desert species in most of the flat to gently sloping terrain, while balancing the need for adequate soil protection.	*Task 1:* Use of livestock grazing or pasture rest to keep RDM levels between approximately 500 and 1,000 pounds per acre in May/June on all pastures
		Task 2: RDM will be monitored on at least six permanent plots (three grazed, three ungrazed) once per year. This will include a minimum of 20 estimates (clip and weigh) of RDM per plot.
		Task 3: RDM will be estimated throughout the conservation area using a combination of clip-plots and visual estimation.
Structure of woody vegetation	*Objective 2:* Restore shrub cover on approximately 500 acres of relatively flat terrain to enhance cover for BNLL and SJAS.	*Task 4:* Use harrow and hand seeding techniques described above. Roughly parallel strips (5 feet wide) at a frequency of two per quarter mile will be prepared and seeded with Atriplex and/or Ephedra seed throughout a 500-acre area. This will be repeated at least once every three years on average until a goal of 1–5% shrub cover is established within the 500 acre area.
		Task 5: Seeded strips will be walked in May or June and the number of shrub seedings will be counted over the entire strip or a strip sample (depending on density). After 3 years of growth, the strips will be sampled for percent shrub cover to determine if objectives have been met.
	Objective 3: Maintain at least 50% of the low-relief area in open grassland with few shrubs (<1%).	*Task 6:* Moderate to high livestock grazing levels (including warm-season grazing) will be used to achieve this objective.
		Task 7: Shrub cover levels will be monitored approximately once per five years by using aerial imagery.
Herbaceous species composition	*Objective 4:* Maintain herbaceous cover species which include some known food plants for GKR (e.g., peppergrass, goldfields, filaree, red brome) through similar grazing patterns that have maintained this mix in the past. Annual changes in abundance and composition of food plants are expected due to fluctuations in rainfall levels.	*Task 8:* Vernal pool species composition will be monitored annually for the first three years and every five years thereafter.
		Task 9: Similar livestock grazing regimes that have supported GKR and their food plants will be continued.
		*Task 10:*Herbaceous species composition will be determined by point-intercept methods described earlier with at least 200 intercepts per plot on at least 3 pairs of plots.
	Objective 5: Monitor annual climatic data	*Task 11:* Establish at least one rain gauge on Valdeao Ranch and monitor precipitation at least monthly.
Key species monitoring objectives and measures	*Objective 6*: Enhance breeding habitat for CTS	*Task 12*: Create up to two CTS breeding ponds.
		Task 13: Perform larval surveys annually for the first three years and then every three years afterwards.
		Task 14: Monitor hydrology within ponds annually for the first three years and once every three years thereafter. Monitor rainfall levels annually.
		Task 15: Perform qualitative surveys of pond condition once during the wet season and once during the dry season.
	Objective 7: Protect current CTS potential breeding ponds	*Task 16:* Continue livestock grazing at similar levels that have maintained CTS in the past.
	Objective 8: Protect potential CTS estivation habitat	*Task 17:* Same as Task 3 above.
		Task 18: Continue livestock grazing at similar levels that have maintained CTS in the past.
		Task 19: Preform qualitative surveys of potential estivation habitat surrounding each pond once during the wet season and once during the dry season.
	Objective 9: Assess trends in abundance of giant kangaroo rats	*Task 20:* Nocturnal small mammals will be monitored once per year using live-trapping methods. Compare abundance trends over time and between grazed and ungrazed plots.
	Objective 10: Assess trends in abundance and distribution of SJKF	*Task 21:* SJKF abundance and distribution will be determined annually using camera stations.
	Objective 11: Assess trends in abundance and distribution of SJAS and BNLL	*Task 22:* SJAS and BNLL abundance and distribution will be determined annually using road surveys.
	Objective 12: Determine presence and distribution of vernal pool branchiopod	*Task 23:* Conduct protocol-level surveys for branchiopod species for two consecutive years. If no listed branchiopod species are observed, conduct protocol-level surveys every 15 years to determine if the status has changed.
		Task 24: Conduct modified wet-season surveys every three years if branchiopods are found.

Metric	Objective	Tasks
		Task 25: Monitor pool hydrology by recording water depth, extent of inundation twice/month during the west season annually for the first three years and every three years thereafter.
	Objective 13: Minimize the risk and spread of new invasive plant infestations	*Task 26:* The use of supplemental feed will be prohibited.
		Task 27: Any newly discovered invasive plant species will be promptly eradicated or controlled with the goal of eventual eradication. A control plan will be developed for those invasive species where multi-year control is needed.
		Task 28: Any new invasive plant species observed during other biological surveys will be noted and mapped. Monitoring on treated sites will be conducted annually for at least three years to determine if the species has been eradicated or if further control is needed.
	Objective 14: Restore habitat as dump sites	*Task 29:*Implement provisions of WMMP.
	Objective 15: Protect vernal pool habitat	*Task 30:* Continue livestock grazing at levels that are known to enhance or maintain vernal pool conservation values.
		Task 31: Qualitatively survey the pools once during the peak flowering period. Photos will be taken and notes recorded on habitat quality, signs of altered hydrology, sedimentation or erosion, invasive plants, and any damage to the pool or surrounding uplands.
	Objective 16: Control public access	Task 32: Construct new fence or maintain current boundary fence in areas where conservation borders private land.
		Task 33: Coordinate with BLM regarding access in areas where conservation land borders BLM land and there is no boundary fence.
		Task 34: Put up boundary signs at a rate of not less than one every 500 feet along the entire boundary.
		Task 35: Remove debris or trash shortly after located to prevent further dumping.

Table 6. Management and Monitoring Objectives and Tasks for Valley Floor Conservation Land

Metric	Objective	Tasks
Structure of herbaceous vegetation	*Objective 1:* Maintain relatively low herbaceous biomass to provide suitable habitat for desert species in most of the flat to gently sloping terrain, while balancing the need for adequate soil protection.	*Task 1:* Use of livestock grazing or pasture rest to keep RDM levels between approximately 500 and 1,000 pounds per acre in May/June on all pastures
		Task 2: RDM will be monitored on at least sixpermanent plots (three grazed, three ungrazed) once per year. This will include a minimum of 20 estimates (clip and weigh) of RDM per plot.
		Task 3: RDM will be estimated throughout the conservation area using a combination of clip-plots and visual estimation.
Structure of woody vegetation	*Objective 2:* Restore shrub cover on approximately 500 acres of relatively flat terrain to enhance cover for BNLL and SJAS.	*Task 4:* Use harrow and hand seeding techniques described above. Roughly parallel strips (5 feet wide) at a frequency of two per quarter mile will be prepared and seeded with Atriplex and/or Ephedra seed throughout a 500-acre area. This will be repeated at least once every three years on average until a goal of 1–5% shrub cover is established within the 500 acre area.
		Task 5: Seeded strips will be walked in May or June and the number of shrub seedings will be counted over the entire strip or a strip sample (depending on density). After 3 years of growth, the strips will be sampled for percent shrub cover to determine if objectives have been met.
	Objective 3: Maintain at least 50% of the low-relief area in open grassland with few shrubs (<1%).	*Task 6:* Moderate to high livestock grazing levels (including warm-season grazing) will be used to achieve this objective.
		Task 7: Shrub cover levels will be monitored approximately once per five years by using aerial imagery.
Herbaceous species composition	*Objective 4:* Maintain herbaceous cover species which include some known food plants for GKR (e.g., peppergrass, goldfields, filaree, red brome) through similar grazing patterns that have maintained this mix in the past. Annual changes in abundance and composition of food plants are expected due to fluctuations in rainfall levels.	*Task 8:* Vernal pool species composition will be monitored annually for the first three years and every five years thereafter.
		Task 9: Similar livestock grazing regimes that have supported GKR and their food plants will be continued.
		Task 10: Herbaceous species composition will be determined by point-intercept methods described earlier with at least 200 intercepts per plot on at least 3 pairs of plots.

Metric	Objective	Tasks
	Objective 5: Monitor annual climatic data	*Task 11:* Establish at least one rain gauge on VFCL and monitor precipitation at least monthly.
	Objective 8: Protect potential CTS estivation habitat	*Task 15:* Continue livestock grazing at similar levels that have maintained CTS in the past.
		Task 16: Preform qualitative surveys of potential estivation habitat surrounding each pond once during the wet season and once during the dry season.
Key species monitoring objectives and measures	*Objective 7*: Protect current CTS potential breeding ponds	*Task 12*: Continue livestock grazing at similar levels that have maintained CTS in the past.
		Task 13: Monitor hydrology within ponds annually for the first three years and once every three years thereafter. Monitor rainfall levels annually. Perform larval surveys annually for the first three years and then every three years afterwards.
		Task 14: Perform qualitative surveys of pond condition once during the wet season and once during the dry season.
	Objective 9: Assess trends in abundance of giant kangaroo rats	*Task 17:* Nocturnal small mammals will be monitored once per year using live-trapping methods. Compare abundance trends over time and between grazed and ungrazed plots.
	Objective 10: Assess trends in abundance and distribution of SJKF	*Task 18:* Kit fox abundance and distribution will be determined annually using camera stations.
	Objective 11: Assess trends in abundance and distribution of SJAS and BNLL	*Task 19:* SJAS and BNLL abundance and distribution will be determined annually using road surveys.
	Objective 12: Determine presence and distribution of vernal pool brachiopod	*Task 20:* Conduct protocol-level surveys for branchiopod species for two consecutive years. If no listed branchiopod species are observed, conduct protocol-level surveys every 15 years to determine if the status has changed.
		Task 21: Conduct modified wet-season surveys every three years if branchiopods are found.
		Task 22: Monitor pool hydrology by recording water depth, extent of inundation twice/month during the west season annually for the first three years and every three years thereafter.
	Objective 13: Minimize the risk and spread of new invasive plant infestations	*Task 23:* The use of supplemental feed will be prohibited.
		Task 24: Any newly discovered invasive plant species will be promptly eradicated or controlled with the goal of eventual eradication. A control plan will be developed for those invasive species where multi-year control is needed.
		Task 25: Any new invasive plant species observed during other biological surveys will be noted and mapped. Monitoring on treated sites will be conducted annually for at least three years to determine if the species has been eradicated or if further control is needed.
	Objective 14: Restore habitat as dump sites	*Task 26:* Implement provisions of WMMP.
	Objective 15: Protect vernal pool habitat	*Task 27:* Continue livestock grazing at levels that are known to enhance or maintain vernal pool conservation values.
		Task 28: Qualitatively survey the pools once during the peak flowering period. Photos will be taken and notes recorded on habitat quality, signs of altered hydrology, sedimentation or erosion, invasive plants, and any damage to the pool or surrounding uplands.
	Objective 16: Control public access	Task 29: Construct new fence or maintain current boundary fence in areas where conservation borders private land.
		Task 30: Coordinate with BLM regarding access in areas where conservation land borders BLM land and there is no boundary fence.
		Task 31: Put up boundary signs at a rate of not less than one every 500 feet along the entire boundary.
		Task 32: Remove debris or trash shortly after located to prevent further dumping.
	Objective 17: Salvage GKR that would likely be killed during project construction	*Task 33:* Capture GKR within the project footprint in accordance with GKR Relocation Plan.
		Task 34: Relocate GKR to suitable but unoccupied habitat on VFCL in accordance with GKR Relocation Plan
		Task 35: Monitor success of GKR colony for 5years.

5.5.3 Silver Creek Ranch

The SCRCL, which is approximately 10,890 acres, is located southeast of the Project Footprint (Figures 2 and 5). The northwestern-most corner of the proposed SCRCL is contiguous with a portion of the VRCL. Elevations on the SCRCL range from 900 to 2,200 feet amsl. Annual Grasslands comprise the majority of ground cover on the site (approximately 8,400 acres) which can be dominated by non-native species in some years. The site also supports ephedra shrubland (approximately 2,260 acres), riparian areas, seeps, springs, and barrens. An area of tamarisk shrubland occurs along Silver Creek and in other areas nearby the creek. Field visits have indicated there are also emergent wetlands and marshes occurring along Panoche Creek. These lands include several seasonal drainages as well as upland habitat.

The purchase and management of the Silver Creek Ranch as conservation land is one of the most significant conservation actions for threatened and endangered species of the San Joaquin Valley. This ranch is specifically mentioned in the USFWS Recovery Plan as a high priority acquisition for the recovery of GKR and BNLL and it is a significant component of the northern core area for SJKF and SJAS. The site has had widespread and dense populations of GKR for many decades as well as concentrations of SJAS, SJKF, and BNLL sightings as well. Because the area has supported good numbers of several T&E species, a conservative approach to management is recommended. Similar land uses such as grazing will continue and only localized habitat enhancement will be attempted.

Management objectives and tasks for Silver Creek Ranch are summarized in Table 7.

Table 7. Management and Monitoring Objectives and Tasks for Silver Creek Ranch Conservation Land

Metric	Objective	Tasks
Structure of herbaceous vegetation	*Objective 1:* Maintain relatively low herbaceous biomass to provide suitable habitat for desert species in most of the flat to gently sloping terrain, while balancing the need for adequate soil protection.	*Task 1:* Use of livestock grazing or pasture rest to keep RDM levels between approximately 500 and 1,000 pounds per acre in May/June on all pastures.
		Task 2: RDM will be monitored on at least twelve permanent plots (six grazed, six ungrazed) once per year. This will include a minimum of 20 estimates (clip and weigh) of RDM per plot.
		Task 3: RDM will be estimated throughout the conservation area using a combination of clip-plots and visual estimation.
Structure of woody vegetation	*Objective 2:* Maintain at least 50% of the low-relief area in open grassland with few shrubs (<1%).	*Task 4:* Moderate to high livestock grazing levels (including warm-season grazing) will be used to achieve this objective.
		Task 5: Shrub cover levels will be monitored approximately once per five years by using aerial imagery.
		Task 7: Herbaceous species composition will be determined by point-intercept methods described earlier with at least 200 intercepts per plot on at least six pairs of plots.
	Objective 4: Monitor annual climatic data	*Task 8:* Establish at least one rain gauge on SCRCL and monitor precipitation at least monthly.
Key species monitoring objectives and measures	*Objective 6*: Protect current CTS potential breeding ponds	*Task 12*: Continue livestock grazing at similar levels that have maintained CTS in the past.
		Task 13: Monitor hydrology within ponds annually for the first three years and once every three years thereafter. Monitor rainfall levels annually. Perform larval surveys annually for the first three years and then every three years afterwards.
	Objective 7: Assess trends in abundance of giant kangaroo rats	*Task 14:* Nocturnal small mammals will be monitored once per year using live-trapping methods. Compare abundance trends over time and between grazed and ungrazed plots.
	Objective 8: Assess trends in abundance and distribution of SJKF	*Task 15:* Kit fox abundance and distribution will be determined annually using camera stations.
	Objective 9: Assess trends in abundance and distribution of SJAS and BNLL	*Task 16:* SJAS and BNLL abundance and distribution will be determined annually using road surveys.
	Objective 10: Determine presence and distribution of vernal pool branchiopod	*Task 17:* Conduct protocol-level surveys for branchiopod species for two consecutive years. If no listed branchiopod species are observed, conduct protocol-level surveys every 15 years to determine if the status has changed.
		Task 18: Conduct modified wet-season surveys every three years if branchiopods are found.
		Task 19: Monitor pool hydrology by recording water depth, extent of inundation twice/month during the west season annually for the first three years and every three years thereafter.
	Objective 11: Minimize the risk and spread of new invasive plant infestations	*Task 20:* The use of supplemental feed will be prohibited.
		Task 21: Any newly discovered invasive plant species will be promptly eradicated or controlled with the goal of eventual eradication. A control plan will be developed for those invasive species where multi-year control is needed.
		Task 22: Any new invasive plant species observed during other biological surveys will be noted and mapped. Monitoring on treated sites will be conducted annually for at least three years to determine if the species has been eradicated or if further control is needed.
	Objective 12: Restore habitat as dump sites	*Task 23:* Implement provisions of WMMP.
	Objective 13: Protect vernal pool habitat (if present)	*Task 24:* Continue livestock grazing at levels that are known to enhance or maintain vernal pool conservation values.
		Task 25: Qualitatively survey the pools once during the peak flowering period. Photos will be taken and notes recorded on habitat quality, signs of altered hydrology, sedimentation or erosion, invasive plants, and any damage to the pool or surrounding uplands.
	Objective 14: Control public access	*Task 26*: Construct new fence or maintain current boundary fence in areas where conservation borders private land.
		Task 27: Coordinate with BLM regarding access in areas where conservation land borders BLM land and there is no boundary fence.
		Task 28: Put up boundary signs at a rate of not less than one every 500 feet along the entire boundary.

Metric	Objective	Tasks
		Task 29: Remove debris or trash shortly after located to prevent further dumping.

6.0 Monitoring Details

The Conservation Land Manager will implement species-specific survey and monitoring tasks to establish current Covered Species habitat use and allow for determination of measurable changes in habitat use and population trends. Survey and monitoring tasks will be designed in a way that allows for tracking of long term trends in Covered Species persistence, habitat use, and estimates of relative population levels on the Conservation Lands.

The Conservation Land Manager will implement monitoring and reporting tasks that will provide responsible agencies with sufficient information to determine that Conservation Lands are sufficiently mitigating impacts to Covered Species and their habitat. All management, research and other activities allowed on the Conservation Lands will include documentation of types of measurements used, pre and post-activity measurements and measured net loss or gain to the Covered Species affected.

Monitoring will be designed to accomplish multiple goals and objectives.

- First, monitoring will be used to track the abundance and distribution of Covered Species.
- Secondly, it will be used to monitor the effectiveness of management so that needed adjustments can be made to management strategies and implementation. When possible, monitoring will be set up experimentally to evaluate management effectiveness.
- Thirdly, monitoring will be used to model the Panoche ecosystem in an effort to learn more about competition and other important drivers in the system. This latter objective will largely be accomplished by monitoring precipitation and multiple species and trophic levels concurrently on permanent plots, allowing for more efficient data collection and evaluation of relationships among species.

Monitoring frequency and effort will vary depending on a species' legal status, importance to the system, ease of monitoring, and sensitivity to management treatments. For example, GKR meets all the above criteria and will be one of the main focal points of

monitoring. Vegetation is a primary driver of the system and a focus of management, therefore it also will be monitored frequently. SJKF, on the other hand, occur at much lower densities and are more difficult to monitor, so their abundance will be monitored less intensively and likely will not be a response variable in any experimental designs.

Monitoring will occur at two levels. First, a relatively intensive monitoring protocol will be established within permanent monitoring plots. Secondly, a series of less intensive, but generally more extensive monitoring will be applied throughout much of the Conservation Lands for species or key variables that are not suitably captured on the monitoring plots. Each type of monitoring is described in more detail below.

6.1 Monitoring Plots

The abundance of key animal and plant species will be monitored on a series of permanent monitoring plots. These plots will be approximately 40 acres in size and paired so that management treatments can be evaluated. Multiple species and trophic levels will be monitored concurrently, allowing for more efficient data collection and evaluation of relationships among species.

Initially, the monitoring plots will be designed to evaluate the effects of livestock grazing on vegetative structure, composition, and abundance of small mammals. Livestock grazing is a historic land use within the Panoche area and it may provide a cost-effective method of vegetation management during wet periods. However, questions remain about possible negative effects during droughts and current research from Brashare's group indicate that GKR have a profound influence on vegetation species composition and production and can remove as much or more vegetation than cattle during some years. Therefore, a legitimate question is whether GKR (at high densities) can modify the habitat sufficiently that livestock may not be needed. Thus questions about grazing and GKR effects on the habitat have important management implications and should be studied further. Long-term monitoring will help answer these questions and be a valuable and efficient way of doing so.

There will be a total of 12 pairs of monitoring plots set up on the Conservation Lands with 6 pairs on SCRCL, and 3 pairs each on the remaining two areas (VFCL and VRCL). Because of the great variability in annual rainfall and resulting vegetative cover and production, control plots are needed to sort out the effects of variation in rainfall. Therefore each pair of plots will consist of one treatment (grazed) and one adjacent control plot (non-grazed) in areas of high GKR density (note this may not be possible on VRCL). The control plots will be approximately 40 acres in size and fenced and the treatment plots will be the same size (for monitoring purposes) but will not be independent of (fenced off) the larger existing grazed pastures. Specific objectives are to compare the relative abundance of GKR and other nocturnal rodents, diurnal animals and plant species composition and production between grazing treatments. It is anticipated that this initial monitoring study will last at least several years to span a wide range of annual rainfall levels and corresponding densities in herbaceous vegetation.

6.1.1 Animal and Plant Surveys on Monitoring Plots

To determine the relative abundance of nocturnal rodents, one small mammal trapping grid (7x7 pattern, 10-meter spacing) will be placed within the center of each plot. Nocturnal rodent abundance will be monitored for five consecutive nights at each site. Non-folding Sherman live traps will be opened and baited one hour before sunset and checked 2.5 hours after sunset. Each trapping session will likely be spread over three weeks in August and/or September of each year. Captured rodents will be identified to species, marked by fur clipping or with temporary fur dye, weighed, sexed, and released at the capture site.

One diurnal monitoring transect will be established within each monitoring plot to assess the abundance of grasshoppers, diurnal mammals, birds and herpetiles. Each transect will be 800 meters in length and will form a square approximately 100 meters inside each plot. Each transect will be slowly walked in May and the number of birds, herpetiles and diurnal mammals seen during the transect will be recorded. For each sighting, the approximate distance from the transect line also will be recorded. Each transect will be repeated three times/year.

Data on vegetative cover will be collected near the end of the growing season (usually March) using the point-intercept method. Four 50-meter transects will be established within each experimental plot and an estimate of vascular plant cover will be determined from the intercept (Bonham 1989) of 100 points along each transect (50 centimeter spacing). Species richness surveys will be conducted by recording all species within 1 meter of the transect to result in a 100 square meter survey plot. Total vegetation cover and the estimated absolute cover of each species along the transect will be recorded. Plant guilds such as native forbs, non-native forbs, native grasses, and non-native grasses will be summarized across the transects.

RDM will be estimated by harvesting, drying, and weighing all grass and forb plants within five 1/4 m^2 plots along each vegetation transect in May or June.

6.1.2 Other Monitoring

As mentioned previously, other monitoring will be performed to capture key species or variables that are not adequately monitored within the above monitoring plots. Examples include precipitation, ranch-wide RDM, SJKF, BNLL, SJAS and wetland-associated species such as CTS.

Precipitation Data

Annual precipitation levels are thought to greatly influence the abundance and distribution of plant and animal species in the Panoche area. Therefore, precipitation data from a minimum of three on-site rain gauges will be collected and summarized to determine the effects of this important variable.

6.2 RDM

Monitoring residual dry matter (RDM) is important for managing California annual rangelands. Although RDM will be monitored on the plots described above, this will only cover a small portion of the ranch. Therefore a more rapid estimation technique suitable for large areas will be employed throughout the entirety of the Conservation Lands (Guenther and Hayes 2008) in May and June. Using this method, a total of five RDM

zones will be established (Table 8). This method will also include performing a series of clip plots in key areas with differing aspects, elevations, and vegetation types to calibrate the surveyor's visual estimates, and traversing much of the Conservation Lands and visually estimating and mapping the area. Key areas should be located within relatively uniform vegetation and away from areas of heavy use by cattle (e.g., watering points). RDM will be measured and photographs will be taken at a minimum of 30 key areas each year for calibration purposes. Photographed key areas will include a robel pole and golf balls for scale and for determining vegetation height. Qualitative information on vegetation composition and structure will be collected at each key area to assess quality of estivation habitat for CTS. Color-coded maps showing RDM zones within each pasture and for the entire conservation area will be produced annually.

RDM will also be measured and or estimated to determine range readiness before livestock are turned out on a given pasture.

Table 8. RDM Objectives and Zone Descriptions

RDM Objective	RDM Class	RDM Description	Color Code
500–1000 lbs/acre	<250	Very Low	
	250–499	Low	
	500–1,000	Meets	
	1001–1500	High	
	>1500	Very High	

6.3 Upland Woody Cover

Woody cover is perennial in nature and therefore less subject to annual variation. Therefore, necessary monitoring frequency is less than with annual vegetation. Woody cover in upland habitats will be monitored primarily by interpreting aerial imagery once

every five years to determine woody cover distribution and density. Field checks including some transects will be conducted in some areas to further quantify changes in density and distribution. Maps of current status of woody cover will be produced from this data once every five years.

6.4 Riparian

A riparian assessment will be conducted across selected reaches of the creek drainages every five years. Reaches will be selected during the first year of monitoring using a stratification process in which reaches are classified and randomly selected. The stratification categories could be based on attributes such as extent of riparian vegetation, slope, width of channel, soil type, and land use (e.g., grazed). Selected reaches will consist of 110 meter lengths of the creek drainages and the same reaches will be monitored during each monitoring year. Start and end points of reaches will be permanently marked in the field. Surveys will occur once every five years and will be conducted at a time of year where the flows are low and the plants are easily identified. Timing of subsequent surveys will be determined by using a similar phenology and flow condition as the previous surveys. Three systematic random transects will be established perpendicular to the drainage within the reach. These transect locations will be used in subsequent surveys.

Photo-documentation will occur during each survey. At a minimum, photos will be taken at the downstream end looking upstream, the downstream end looking across the drainage, the upstream end looking downstream, and the upstream end looking across the drainage.

During surveys, the green line will be located, the first perennial vegetation, embedded rock, or anchored wood above the water line on or near the water's edge (Winward 2000). The edge of the low flow channel will be used if the greenline is not readily apparent. The width of the riparian habitat or area influenced by the creek will be measured. Systematic randomly located 1-m^2 plots will be established perpendicular to the greenline, starting with the first plot centered on the green line or at edge of low flow channel. The total number of plots along the transect may vary depending on the width of

the riparian corridor. However, plots will be established to sample at least 5% of the total transect length, with a minimum of 3 plots per transect. Within each plot, plant species composition and cover will be recorded by species. The same plot locations will be used in subsequent surveys.

Woody vegetation will be monitored along belts at each of the 3 permanently established transects within each selected reach. Belt transects will be 5 meters wide and the length of the riparian width. The same length belt transect will be sampled during each subsequent monitoring survey. The total number of individual or stems (if multi-branched), size class, and age (e.g., seedling, young, mature) will be recorded by species for each woody plant rooted within the plot. Size classes will be established prior to surveys. This information should provide insight on changes in structure and composition of the riparian habitat and whether regeneration is occurring.

During each survey, a streambank alteration assessment will be conducted (BLM 2011). A 92 cm long sample line is carried during surveys perpendicular to the creek and centered on the green line described above. The surveyor walks the length of the selected reach on both sides carrying the sample segment. Each step is recorded as altered or not altered. A line is considered altered if there is obvious current year's disturbance (e.g. hoof prints, trails) by large herbivores (e.g., cattle, sheep) (BLM 2011). The amount of alteration along a reach is determined by tallying the positive results and expressing them as a percent. This will provide a measure of grazing use change over time.

During the survey, the reach will be walked and general information will be collected on substrate, and signs of erosion or sediment deposition.

6.4.1 Vernal Pools

In order to assess impacts of vegetation management and climatic variation on the vernal pool flora and develop long-term management strategies, vernal pool vegetation monitoring surveys will be conducted at vernal pools annually for the first three years and then every five years. Vernal pool vegetation sampling methods will follow those described in *Classification, Ecological Characterization, and Presence of Listed Plant*

Taxa of Vernal Pool Associations in California (Barbour et al., 2007). One 10-meter^2 plot will be placed in each vegetation zone within each sampled pool. Total vegetation cover and the estimated absolute cover of each species within the plot will be recorded. Plant guilds such as native forbs, non-native forbs, native grasses, and non-native grasses will be summarized across the plots.

6.5 Covered Species

6.5.1 BNLL and SJAS

Although BNLL and SJAS will likely be recorded during the vertebrate monitoring plots, sample size will likely be too low to conclude much about the population trajectories of these listed species. Therefore, road surveys also will be implemented to assess the distribution and relative abundance of these two species. Other species of interest (e.g., burrowing owl) likely also will be recorded during road surveys. During road surveys, an observer will slowly drive along established routes and obtain locations for each BNLL, SJAS and other notable wildlife species using a global positioning system. These data points will be uploaded to a geographic information system database and the California Natural Diversity Database (CNDDB) to provide a permanent record of these species' spatial distribution over time.

6.5.2 SJKF

Because of their large home ranges and relatively low density, SJKF will be monitored using baited camera traps or scent stations. This technique provides an index of abundance and a measure of spatial distribution through time. Cameras will be placed at 30 sites spaced at least ½ mile apart and operated for at least five consecutive nights (minimum of 150 camera-station nights). Counts of SJKF and other animals photographed at each site will be recorded and summarized by year.

6.5.3 California Condor

No special surveys are planned to monitor use of the site by CACO. However, incidental sighting of condors will be recorded.

6.5.4 CTS

The objective of the conservation strategy for CTS is to permanently protect and increase habitat for CTS on the Conservation Lands. Monitoring will be conducted to determine whether the created CTS pond(s) are maintaining the desired conditions for CTS, whether CTS are using the existing and created pond(s) on the Conservation Lands, and to evaluate the quality of estivation habitat.

The objective of the constructed CTS breeding pond(s) is that they capture sufficient surface water runoff to fill to no more than three feet during the rainy season and that they will have continuous inundation for sufficient time for CTS larval development and metamorphosis (at least 10 weeks). The pond(s) will need to have seasonal dry-down no later than September to preclude bullfrogs from colonizing the pond and successfully recruit metamorphs. It is also desired under average rainfall conditions that the pond(s) be inundated five out of every ten years, with a minimum of three out of every ten years.

Hydrology will be monitored in existing and created pond(s) to determine whether ephemeral conditions occur that are favorable to CTS breeding and conditions that will reduce the likelihood of the presence of CTS predators (e.g., bullfrogs). Hydrology monitoring will occur annually for the first three years and every three years thereafter for all created and existing ponds on the Conservation Lands. Staff gauges will be installed within each pond within 6 to 12 months after Project construction. Depth and approximate percent of inundation will be recorded monthly throughout the rainy season at each pond.

Rainfall will be tracked annually during the rainy season (November through March) for the Conservation Lands to determine the rainfall amount and how it compares to the historic average. This will be done by installing a rain gauge on-site and recording the rainfall amount monthly.

Permanent photopoints will be established to document the conditions of the created CTS pond(s). Photos will be taken during the peak rainy season and at the end of the rainy season to document the seasonal dry-down period. Photographs will be taken annually.

The purpose of photo points would be to assess observable qualitative and quantitative changes.

Visual qualitative surveys will be conducted annually at all the existing and created pond(s) once during the wet season and once during the dry season. These surveys will document the vegetation composition and structure around each of the ponds, record hydrology, document any signs of erosion or sedimentation, presence of any invasive plant species, and monitor any structural components and associated structures for the created CTS pond(s). During surveys, any relevant recommendations will be made to improve CTS habitat conditions. In addition, recommended maintenance activities for the created CTS pond(s) will be made during this time. The desired conditions, original size, and dimensions of the pond(s) will be used as the control to determine whether maintenance or repair of the pond is necessary.

Annual larval surveys will be conducted for the first three years and every three years thereafter by a qualified biologist within all existing and created CTS pond(s) to determine whether or not CTS are present, if they are breeding, and if bullfrogs or other introduced predators are present. The purpose of these surveys is to provide a temporal snapshot of the status of the CTS on an ongoing basis and will include quantitative data on species and habitat condition such as non-native invasive species presence or absence, predator presence or absence and other known threats. Size and life stage will be noted during surveys with CTS larvae above 70mm in length deemed large enough to successfully metamorphose. Prior to surveys taking place, per USFWS 10A(1)a and CDFW Scientific Collection Permit requirements, surveyors shall notify the agencies of the proposed methodology to be used during the surveys. Methodologies shall follow the most current guidance from the regulatory agencies and shall be the most minimally invasive to achieve the desired data.

Short-statured grassland habitat is the desired condition for CTS estivation habitat surrounding the ponds. In addition to qualitative assessments of habitat immediately surrounding the ponds, qualitative vegetation composition and structure information will be collected at RDM survey locations to determine whether these conditions are present

in estivation habitat further from the ponds. Notes on invasive plant species will be collected during these surveys. Recommendations to improve CTS estivation habitat will be made during these surveys. This could include changing the grazing regime or removing invasive plant species, among others.

6.5.5 Listed Vernal Pool Branchiopod Species

The objective of the conservation strategy for the potential listed vernal pool branchiopod species (i.e. VPFS, CFS, LFS, VPTS) is to determine presence and distribution, and permanently protect these species on the Conservation Lands. Monitoring will be conducted to determine the presence and distribution of each species, monitor the species if present, and conduct qualitative surveys to determine whether there are any potential changes to the habitat that could impact the species.

Protocol-level surveys will be conducted for two years in a row to determine if the covered listed vernal pool branchiopod species are present on the Conservation Lands and their distribution. Methods will follow the most current guidance from the regulatory agencies. If no listed vernal pool branchiopod species are observed, protocol-level surveys will be conducted every 15 years to determine if the status has changed.

If it is determined that listed vernal pool branchiopod species are present on the Conservation Lands, modified wet-season monitoring surveys will be conducted every three years within the vernal pools. Monitoring will be conducted twice during the wet season to target the potential listed species present. At each pool, five to 15 standardized dip-net pulls will be completed and species and relative abundance will be recorded for all individuals collected. Photos will be taken of each pool during surveys and a CNDDB form will be submitted to CDFW for all listed species observed.

Hydrology monitoring will be conducted to determine the extent of ponding in relation to precipitation patterns over time and to inform vernal pool branchiopod surveys. Vernal pool branchiopod survey methods will follow those described in the *Listed Vernal Pool Crustaceans Routine Monitoring Protocol for Preserved Areas* prepared by Carol Witham in consultation with Holly Herod and others at the USFWS (Appendix H).

Surveys will be conducted annually for the first three years and every three years thereafter. Staff gauges will be installed within each pool. Depth and extent of inundation will be recorded approximately twice monthly throughout the wet season.

Qualitative surveys will be conducted once during the spring during peak vegetation flowering period. Surveys will consist of taking a photo of each pool, and making general notes on habitat quality, signs of altered hydrology, sedimentation or erosion activity, trash and debris, any damages from other activities, and whether any invasive plant species are present.

7.0 Adaptive Management

Adaptive management has been identified earlier as one of the main management principles by which the Conservation Lands will be managed in perpetuity (Section 4). Another definition of adaptive management is provided in the USFWS Five Point Policy for Habitat Conservation Plans as "a method for examining alternative strategies for meeting measurable biological goals and objectives, and then if necessary, adjusting future conservation management actions according to what is learned" (USFWS 2000). Grazing will be based on an adaptive management strategy that has been defined as an integrated method for addressing uncertainty in natural resource management (Holling 1978; Walters 1986; Gundersen 1999).

7.1 Overview

Various conditions change on properties over time and can result in a need to change practices that worked, or were assumed to work, previously. This is especially true when applied to land management over decades. However, changes should not be made arbitrarily. Qualified biologists familiar with the species in question, the methods being employed and results of relevant monitoring and research should be the only people suggesting changes. These changes should not occur for management or financial purposes but only for the benefit of the Covered Species and/or Conservation Lands.

7.2 Management Strategy Adjustment Process

During the implementation of the HMP, the Conservation Land Manager may determine that a modification of procedures is needed. This is a normal part of the adaptive management process. The reasons for the needed change, recommended changes, risks, and benefits of changing procedures should be investigated and documented. If the change is minor, the Conservation Land Manager can determine if the change should be implemented. If the procedure is changed significantly or has the potential to significantly impact Covered Species, concurrence from the state or federal permitting agencies should be obtained before implementation of the new strategy. Any changes that are more environmentally protective than the previously approved methods may be implemented as needed. However, no alterations which reduce the level of monitoring effort will be put in place without prior authorization from permitting agencies. An example of an acceptable exception would be implementation of updated regulatory agency protocols for species surveys.

8.0 Coordination and Outreach

Given the conservation objectives and mitigation-related origin on the Conservation Lands, the property will be largely managed as an independent unit. However, where there are opportunities to enhance the conservation values, reduce stewardship costs, or increase stewardship efficiency, coordination with and outreach to others will be used to best effect.

Agency Coordination – Where lands adjacent to or in the vicinity of the Conservation Lands are owned and managed for similar conservation objectives and with compatible land uses—in particular, by BLM and CDFW—effort will be expended to coordinate any management or monitoring activities in a way that would increase efficiency, improve conservation effect or information gained, and/or reduce costs. Coordination will also take the form of notification for any opportunities to improve their stewardship activities or gain additional stewardship funding, any activities that may impact their lands (e.g., pesticide application under certain conditions), new and concerning exotic invasives,

pathogen outbreaks, and other forms as necessary. In general, a 'good neighbor' ethic will be embraced for stewardship.

Public access criteria –In general, there will be no public access to the Conservation Lands, the primary purpose being conservation and there being certain habitat and species sensitivities. Further, provisions for public recreation—that would provide for the security of both the public and the sensitive species—would be an administrative and cost burden that is neither anticipated by the Applicant nor required by the Agencies. Access would be provided under certain circumstances to entities other than the Owner/Applicant, including the following uses and conditions:

a. Lessees: Grazing leases are anticipated to serve conservation objectives through vegetation management. Those lessees would, of course, have access to the Conservation Lands for this purpose, with specific conditions determined and documented in the leases.
b. Agencies: Access to the Conservation Lands will be provided to the Agencies through the Conservation Easement and in service of their role as third-party beneficiaries in enforcing and defending the easement.
c. Public safety entities: Public safety entities (including fire and police departments) will have access to the Conservation Lands for public safety purposes. It is intended that relationships be established with these entities, and documents provided to them, such that public safety activities are conducted with minimum disturbance to the conservation values. Decisions regarding appropriate response to wildfires (e.g., whether areas should be allowed to burn versus aggressive fire control) and plans for any needed fuel breaks will be developed between the Conservation Land Manager and the fire departments.
d. Additional public safety entities: Engagement with other public agencies (such as the US Department of Agriculture or Mosquito and Vector Control Districts) will be undertaken, usually upon their request or in response to public notices that pertain to the Conservation Lands. If there are instances where the directed actions or requests from those agencies conflict with the conservation objectives of the Conservation Lands, there will be an effort made to engage the agencies in

a discussion to determine a course of action that serves both public interests (that of conservation and of the specific agency objective).

e. Other entities with compatible land use: On a case-by-case basis, and to the extent possible with available management resources, other compatible land uses will be considered (e.g., bee keeping).
f. Research: Biological monitoring and applied research are part of the management approach and key to adaptive management on the Conservation Lands. Where this lends itself to publications, these will be prepared and submitted to an appropriate scientific or other professional journal so as to enhance the capacity in the general conservation community. Such information will also be communicated in meetings, conferences, informal reports, and website representations.

In addition, there will be requests received from others (e.g., academic or other nonprofit organization researchers, private consultants, etc.) to conduct research on the Conservation Lands. Each research request will be reviewed to determine whether it:

1. Poses no appreciable risk to the species, biological processes, or abiotic environment;
2. Will result in information that contributes to effective conservation of the Conservation Lands
3. Does not require excessive oversight or other management resources.

For any research involving or potentially impacting a protected species, the researcher will be required to obtain appropriate state and/or federal permits. If the research is approved, the researcher will be required to approve and sign an agreement to limit liability of the manager and land owner, include acknowledgement of any assistance (of manager) in any reports or publications, and provide copies of related reports and publications for the record.

a. Other access: Access of other groups for educational or other purposes will be initiated or requests entertained on a case by case basis, with decisions based on the purpose of the access, any risk to the Conservation Lands, any benefit to the

Conservation Lands, and the resources required by the manager to accommodate or organize such access.

9.0 Reporting

An annual report will be prepared for the previous fiscal year (October 1–September 30) that describes the general conditions on the Conservation Lands, stewardship activities undertaken that year (including all management, monitoring, and the Conservation Easement activities—if the easement holder is the same entity as the manager), summaries of biological monitoring results, and outreach and coordination activities. Emerging trends and/or issues will be described. As experience and data accumulate, the reports will increasingly provide a longer term perspective, comparing the previous year with data and observations from previous years. This report will be provided to the regulatory agencies and land owner with a target date of the 1st of January.

Other reports to regulatory agencies will be prepared as required, including reports on activities conducted under a USFWS 10(a)(1)(A) permit or state permits.

10.0 Funding

The funding requirements for management and for monitoring, enforcement, and defense of the Conservation Easement over the Conservation Lands will be determined by a comprehensive due diligence process and use of the PAR3© software (Rogers 2012). Funds required for these purposes include three years of management costs and an endowment—funded in full at the beginning of the three-year initial management period—that has been calculated to provide an appropriate average annual budget based on a long-term drawdown (aka capitalization rate) of 4.5% (i.e., CNLM's current capitalization rate for conservation endowments it manages for preserves in its portfolio). The initial management amount provides a source of funds for responsibilities towards the Conservation Lands in the first years of operation, allowing the endowment time to begin accumulating investment income for use to support management expenses after the three-year period elapses, as well as protecting the value of the endowment during the

first few years following establishment, buffering against any temporary downward trend in the market.

The initial and endowment costs for management and activities related to the Conservation Easement(s) will be presented in a PAR report and accompanied by a detailed cover letter that presents all assumptions. Costs for initial specific restoration and protection activities—including initial CTS pond(s) creation, dump site restoration, riparian restoration, vernal pool enhancement, and GKR relocation, and all of the maintenance, monitoring, and attaining success criteria that is associated with these activities—will be calculated separately.

11.0 References

Anderson, E. M. (1990). Bobcat diurnal loafing sites in southeastern Colorado. *Journal of Wildlife Management, 54*(4), 600–602.

Barbour, M. G., Solomeshch, A. I., Buck, J. J., Holland, R. F., Witham, C. W., MacDonald, R. L., Starr, S. L., & Lazar, K. A. (2007). *Classification, ecological characterization, and presence of listed plant taxa of vernal pool associations in California* (Final report, U.S. Fish and Wildlife Service Agreement/Study No. 814205G238). Davis, CA: Author.

Bartolome, J. W., Frost, W. E., McDougald, N. K., & Connor, M. (2006). California guidelines for residual dry matter (RDM) management on coastal and foothill annual rangelands (Rangeland series publication 8092, revised). Davis, CA: University of California Division of Agriculture and Natural Resources. 8 pp.

Bean, W. T., Stafford, R., Prugh, L.R., Butterfield, H. S., & Brashares, J. S. (2012). An evaluation of monitoring methods for the endangered giant kangaroo rat. *Wildlife Society Bulletin, 36*, 587–593.

Best, T.L., A.S. Titus, C.L. Lewis, and K. Caesar. 1990. Ammospermophilus nelson. Mammalian Species 367:1-7.

BirdLife International (2013). "Gymnogyps californianus". IUCN Red List of Threatened Species. Version 2013.2. International Union for Conservation of Nature. Retrieved 26 November 2013

Bonham Charles D 1989. Measurements for Terrestrial Vegetation. Wiley-Interscience publication, 338 pages.

Bureau of Land Management. 2011. Riparian Area Management, Multiple Indicator Monitoring (MIM) of Stream Channels and Streamside Vegetation. Technical reference 1737-23 (revised).

California Department of Fish and Wildlife (CDFW). (2015). Letter to Center for Natural Lands Management RE: Application for nonprofit organization requesting to hold and manage mitigation lands, May 12, 2015.

Center for Natural Lands Management (CNLM). (2014). *Conservation easement monitoring, enforcement, and defense policy* (Revised on March 20, 2014 via Resolution 218-14). Temecula, CA. http://cnlm.org/about-cnlm/policies/

Clark, H. O. Jr., Warrick, G. D., Cypher, B. L., Kelly, P. A., Williams, D. F., & Grubbs, D. E. (2005). Competitive interactions between endangered kit foxes and nonnative red foxes. *Western North American Naturalist, 65*(2), 153–163.

Cypher, B. L. and Brown A.D. (2006). Demography and ecology of endangered San Joaquin kit foxes at the Bena Landfill, Kern County, California. California State University-Stanislaus, Endangered Species Recovery Program, Fresno, California. 16 pp.

Cypher, B. L., & Frost, N. (1999). Condition of kit foxes in urban and exurban habitats. *The Journal of Wildlife Management, 63*(3), 930–939.

Cypher, B. L., & Spencer, K. A. (1998). Competitive interactions between coyotes and San Joaquin kit foxes. *Journal of Mammalogy, 79*(1), 204–214.

Cypher, B. L., Warrick, G. D., Otten, M. R. M., O'Farrell, T. P., Berry, W. H., Harris, C. E., Kato, T. T., McCue, P. M., Scrivner, J. H., & Zoellick, B.W. (2000). Population dynamics of San Joaquin kit foxes at the Naval Petroleum Reserves in California. *Wildlife Monographs, 145*, 1–43.

Cypher, B.L., Van Horn Job, C., & Phillips, S. (2012). Conservation strategies for San Joaquin kit foxes in urban environments (Prepared for the U.S. Bureau of Reclamation, Agreement No. R11AP20502). Turlock, CA: California State University, Stanislaus, Endangered Species Recovery Program. 32 pp.

Cypher, B. L., Phillips, S. E., & Kelly, P. A. (2013). Quantity and distribution of suitable habitat for endangered San Joaquin kit foxes: conservation implications. *Canid Biology and Conservation, 16* (7)*,* 25–31. Retrieved from http://www.canids.org/CBC/16/san_joaquin_kit_fox_habitat_suitability.pdf

Cypher, E. (1994). *Demography of Caulanthus californicus, Lembertia congdonii, and Eriastrum hooveri, and vegetation characteristics of endangered species populations in the southern San Joaquin Valley and the Carrizo Plain Natural Area in 1993*. Sacramento, CA: California Department of Fish and Game. 68 pp.

D'Antonio, C. M., Malmstrom, C., Reynolds, S. A., & Gerlach, J. (2007). Ecology of invasive non-native species in California grassland. In M. R. Stromberg, J. D. Corbin, & C. M. D'Antonio (Eds.), *California grasslands: Ecology and management* (pp. 67–83). Berkeley, CA: University of California Press.

Daneke, D., Sunquist, M., & Berwidk, S. (1984). Notes on kit fox biology in Utah. *Southwestern Naturalist, 29*, 361–362.

Egoscue, H. J. (1962). Ecology and life history of the kit fox in Tooele County, Utah. *Ecology, 43*(3), 481–497.

Ford, L. D., Van Hoorn, P. A., Rao, D. R., Scott, N. J., Trenham, P. C., & Bartolome, J. W. (2013). *Managing rangelands to benefit California red-legged frogs and California tiger salamanders*. Livermore, CA: Alameda County Resource Conservation District. 76 pp. Retrieved from: http://www.rangelandconservation.com/Documents/ManagingRangelandsCRLF_CTS.pdf

Gallagher, S. P. (1996). Seasonal occurrence and habitat characteristics of some vernal pool branchiopoda in northern California, U. S. A. *Journal of Crustacean Biology, 16*(2), 323–329.

George, M., Bartolome, J.W., McDougald, N., Connor, M. Vaughn, C., & Markegard, G. 2001. Annual range forage production. Oakland: University of California Division of Agriculture and Natural Resources Publication 8018.

Germano, D. J. (2003). Gambelia sila (blunt-nosed leopard lizard) predation. *Herpetological Review, 34*(2), 143–144.

Germano, D. J., Rathbun, G. B., Saslaw, L. R., Cypher, B. L., Cypher, E. A., & Vredenburgh, L. M. (2011). The San Joaquin desert of California: Ecologically misunderstood and overlooked. *Natural Areas Journal, 31*(2), 138–147. Retrieved from: http://www.csub.edu/~dgermano/SanJoaquinDesert.pdf

Germano, D. J., Rathbun, G. B., & Saslaw, L. R. (2012). Effects of grazing and invasive grasses on desert vertebrates in California. *Journal of Wildlife Management,* 76 (4), 670–682. Retrieved from: http://www.csub.edu/~dgermano/GrazingStudy-Lokern_JWM.pdf

Goldingay, R. L., Kelly, P. A., & Williams, D. F. (1997). The kangaroo rats of California: Endemism and conservation of keystone species. *Pacific Conservation Biology, 3,* 47–60.

Golightly, R. T. (1981). *The comparative energetics of two desert canids: The coyote (Canis latrans) and the kit fox (Vulpes macrotis)* (Doctoral dissertation). Arizona State University, Tempe, Arizona.

Grinnell, J. (1932). Habitat relations of the giant kangaroo rat. *Journal of Mammalogy, 13*(4), 305–320.

Grinnell, J., Dixon, J. S., & Linsdale, J. M. (1937*). Fur-bearing mammals of California: Their natural history, systematic status, and relations to man* (Vol. II). Berkeley, CA: University of California Press.

Guenther, K., & Hays, G. (2008). *Monitoring annual grassland residual dry matter.* Wildland Solutions.

Hall Cushman, J., Tierney, T. A., & Hinds, J. M. (2004). Variable effects of feral pig disturbances on native and exotic plants in a California grassland. *Ecological Applications, 14*, 1746–1756.

Harris, J.H. and D.M. Stearns. (1991). Population density,, census methods, habitat relationships, and home range of the San Joaquin antelope squirrel, 1988-89, California Department of Fish and Game. Nongame Bird and Mammal Section Report 91-02. 37 pp.

Hawbecker, A. C. (1944). The giant kangaroo rat and sheep forage. *The Journal of Wildlife Management, 8*(2), 161–165.

Hawbecker, A. C. (1951). Small mammal relationships in an ephedra community. *Journal of Mammalogy*, *32*(1), 50–60.

Heady, J. F. (1977). Valley grassland. In M. B. Barbour, & J. Major (Eds.) *Terrestrial vegetation of California* (pp. 491–514). New York, NY: Wiley and Sons.

Helm, B. P. (1998). Biogeography of eight large branchiopods endemic to California. In C. W. Witham, E. T. Bauder, D. Belk, W. R. Ferren Jr., & R. Ornduff (Eds.), *Ecology, conservation, and management of vernal pool ecosystems – Proceedings from a 1996 conference* (pp. 124–139). Sacramento, CA: California Native Plant Society.

Lancia, R. A., Miller, S.D., Adams, D. A., & Hazel, D. W. (1982). Validating habitat quality assessment: An example. *Transactions of the North American Wildlife and Natural Resources Conference, 47*, 96–110.

Lee, K.N. 1993. Compass and gyroscope: integrating science and politics for the environment. Island Press, Washington, D.C.

Leitner, P., & Leitner, B. M. (1998). Coso grazing exclosure monitoring study, Mohave ground squirrel study Coso Known Geothermal Resource Area, Major Findings 1988–1996 (Final Report).

Lewis, J. C., Sallee, K. L., & Golightly, R.T. Jr. (1999). Introduction and range expansion of nonnative red foxes (Vulpes vulpes) in California. *American Midland Naturalist, 142*(2), 372–381.

Marty, J.T. 2005. Effects of Cattle Grazing on Diversity in Ephemeral Wetlands. Conservation Biology 19(5): 1626–1632.

Morrell, S. (1972). Life history of the San Joaquin kit fox. *California Fish and Game, 58*(3), 162–174.

Minnich, R. A. (2008). California's fading wildflowers: Lost legacy and biological invasions. Berkeley, CA: University of California Press.

Nelson, J. L., Cypher, B. L., Bjurlin, C. D., & Creel, S. (2007). Effects of habitat on competition between kit foxes and coyotes. *Journal of Wildlife Management*, *71*, 1467–1475. doi:10.2193/2006-234

O'Farrell, T. P., Berry, W. H., & Warrick, G. D. (1987). *Distribution and status of the endangered San Joaquin kit fox, Vulpes macrotis mutica, on Fort Hunter Liggett and Camp Roberts, California* (Report Number: EGG 10282-2194, EG&G Measurements, Inc.). Goleta, CA. 74 pp. + Appendices.

Olney, B. (2008). Seed preferences of the giant kangaroo rat (*Dipodomys ingens*) in grasslands of the Carrizo Plain, California (Senior thesis). University of California, Berkeley. Obtained from Dr. Justin Brashares, University of California, Berkeley Professor, March 12, 2015.

Orloff, S., Hall, F., & Spiegel, L. (1986). Distribution and habitat requirements of the San Joaquin kit fox in the northern extreme of their range. *Transactions of the Western Section of the Wildlife Society*, *22*, 60–70.

Prugh, L. R., & Brashares, J. S. (2012). Partioning the effects of an ecosystem engineer: Kangaroo rats control community structure via multiple pathways. *Journal of Animal Ecology, 81*, 667–678.

Ralls, K., & White, P. J. (1995). Predation on San Joaquin kit foxes by larger canids. *Journal of Mammalogy, 76*(3), 723–729.

Reese, E. A., Standley, W. G., & Berry, W. H. (1992). Habitat, soils, and den use of San Joaquin kit fox (*Vulpes velox macrotis*) at Camp Roberts Army National Guard Training Site, California (Topical Report No. EGG 10617-2156). Washington, DC: U. S. Department of Energy.

Rogers, D. L. (2012). Preparing for perpetuity: Decision-support for calculating the perpetual costs of stewardship (pp. 128–129). In *wetland and stream mitigation: A handbook for land trusts*. Washington, D.C.: Environmental Law Institute and Land Trust Alliance. Retrieved from: http://www.eli.org/sites/default/files/eli-pubs/d22_04.pdf

Rogers, D.L. (2008). Adaptive Management, CNLM White Paper, 2 pp. Center for Natural Lands Management.

Sawyer, J. O., & Keeler-Wolf, T. (1995). *A manual of California vegetation*. Sacramento, CA: California Native Plant Society.

Sawyer, J. O., Keeler-Wolf, T., & Evens J. M. (2009). *A manual of California vegetation* (2nd ed.). Sacramento, CA: California Native Plant Society. 1300 pp.

Seton, E. T. (1925). Lives of game animals (Vol I): Cats, wolves, and foxes. Garden City, NY: Doubleday, Doran and Company.

Schiffman, P. M. (1994). Promotion of exotic weed establishment by the endangered giant kangaroo rat (Dipodomys ingens) in a California grassland. *Biodiversity and Conservation, 3*, 524–537.

Schiffman, P. M. (2007). Species composition at the time of first European settlement. In M. R. Stromberg, J. D. Corbin, & C. M. D'Antonio (Eds.), *California grasslands: Ecology and management* (pp. 52–56). Berkeley, CA: University of California Press.

Shaughnessy, M.J. Jr. 2003. Swift fox detection methods and distribution in the Oklahoma Panhandle *in* L.N. Carbyn & Sovada, M.A. (Eds.), *The swift fox: ecology and conservation of swift foxes in a changing world* (pp. 61-69) Canadian Plains Research Center, University of Regina, Saskatchewan, Canada.

Shaw, W. T. (1934). The ability of the giant kangaroo rat as a harvester and storer of seeds. *Journal of Mammalogy, 15*(4), 275–286.

Spiegel, L. K., & Bradbury, M. (1992). Home range characteristics of the San Joaquin kit fox in western Kern County, California. *Transactions of the Western Section of the Wildlife Society*, *28*, 83–92.

Spiegel, L.K. and Small, M. (1996). Estimation of relative abundance of San Joaquin kit foxes between an undeveloped and oil-developed site in Kern County, California. Pages 115-124 *in* L.K. Spiegel, ed. Studies of the San Joaquin kit fox in undeveloped and oil-developed areas. California Energy Commission, Sacramento, California,.

Standley, W. G., Berry, W. H., O'Farrell, T. P., & Kato, T. T. (1992). *Mortality of San Jaoquin kit fox at Camp Roberts Army National Guard Training Site, California* (Topical Report No. EGG 10627-2157). Goleta, CA: U. S. Department of Energy.

Stokes, D., Cook, D. G., & Trenham, P. C. (2008). *Sonoma California tiger salamander population ecology and preserve management: An eight year study*. Sacramento, CA*:* U.S. Fish and Wildlife Service. 34 pp.

Tappe, D. T. (1941). Natural history of the Tulare kangaroo rat. *Journal of Mammalogy, 22*(2), 117–148.

Tollestrup, K. (1979). *The ecology, social structure, and foraging behavior of two closely related species of leopard lizards, Gambelia silus and Gambelia wislizenii* (Doctoral dissertation). University of California–Berkeley, Berkeley, CA. 292 pp.

Trenham, P. C., & Shaffer, H. B. (2005). Amphibian upland habitat use and its consequences for population viability. *Ecological Applications*, *15*(4), 1158–1168. doi: 10.1890/04-1150

Trenham, P. C., Koenig, W. D., & Shaffer, H. B. (2001). Spatially autocorrelated demography and interpond dispersal in the salamander Ambystoma californiense. *Ecology, 82*(12), 3519–3530.

U.S. Fish and Wildlife Service (Service). 1996. *California condor recovery plan, third revision*. USFWS, Pacific Region, Portland, OR. 62 pp.

U.S. Fish and Wildlife Service (USFWS). (1998). *Recovery plan for upland species of the San Joaquin Valley, California*. Portland, OR.

U.S. Fish and Wildlife Service (USFWS). (2005). *Recovery plan for vernal pool ecosystems of California and southern Oregon*. Portland, OR: Author. pp. xxvi–606. Retrieved from http://ecos.fws.gov/docs/recovery_plans/2006/060307_docs/doc531.pdf

U.S. Fish and Wildlife. (2010). Endangered and threatened wildlife and plants: Revised designation of critical habitat for California red-legged frog; Final rule. Federal Register 75(51):12816-12959.

U.S. Fish and Wildlife Service (USFWS). (2010a). *San Joaquin kit fox (Vulpes macrotis mutica) 5-year review: Summary and evaluation*. Sacramento, CA: Author. 123 pp.

U.S. Fish and Wildlife Service (USFWS). (2010b). *Giant kangaroo rat (Dipodomys ingens) 5-year review: Summary and evaluation*. Sacramento, CA: Author. 50 pp.

U.S. Fish and Wildlife Service (USFWS). (2010c). *Blunt-nosed leopard lizard (Gambelia sila) 5-year review: Summary and evaluation*. Sacramento, CA: Author. 79 pp. Retrieved from http://www.fws.gov/ecos/ajax/docs/five_year_review/doc3209.pdf

Warrick, G. D., & Cypher, B. L. (1998). Factors affecting the spatial distribution of San Joaquin kit foxes. *Journal of Wildlife Management, 62*(2), 707–717.

Warrick, G. D., Kato, T. T., & Rose, B. R. (1998). Microhabitat use and home range characteristics of blunt-nosed leopard lizards. *Journal of Herpetology, 32*(2), 183–191.

White, P. J., & Garrott, R. A. (1997). Factors regulating kit fox populations. *Canadian Journal of Zoology, 75*(12), 1982–1988.

White, P. J., & Ralls, K. (1993). Reproduction and spacing patterns of kit foxes relative to changing prey availability. *Journal of Wildlife Management, 57*(4), 861–867.

White, P. J., Ralls, K., & Vanderbilt White, C. A. (1995). Overlap in habitat and food use between coyote and San Joaquin kit foxes. *The Southwestern Naturalist, 40*(3), 342–349.

White, P. J., Vanderbilt-White, C. A., & Ralls, K. (1996). Functional and numerical responses of kit foxes to a short-term decline in mammalian prey. *Journal of Mammalogy, 77*(2), 370–376.

Wilhere, G.F. 2002. Adaptive management in habitat conservation plans. Con. Bio. 16(1):20-29.

Williams, D. F., & Kilburn, K. S. (1991). Dipodomys ingens. *Mammalian Species, 377*, 1–7.

Williams, D. F. (1992). Geographic distribution and population status of the giant kangaroo rat, Dipodomys ingens (Rodentia, heteromyidae). In D. F. Williams, S. Byrne, & T. A. Rado (Eds.), *Endangered and sensitive species of the San Joaquin Valley, California* (pp. 301–328). Sacramento, CA: California Energy Commission.

Williams, D. F., Germano, D. J., & Tordoff, W. III. (1993). *Population studies of endangered kangaroo rats and blunt-nosed leopard lizards in the Carrizo Plain Natural Area, California* (Nongame Bird and Mammal Sec. Rep. 93-01). Sacramento, CA: California Department of Fish and Game. 114 pp.

Williams, D. F., Davis, M. K., & Hamilton, L. P. (1995). *Distribution, population size, and habitat features of giant kangaroo rats in the northern segment of their geographic range* (Bird and Mammal Conservation Program Report 95-01). California Department of Fish and Game. 44 pp.

Winward, A.H. 2000. Monitoring the riparian resources in riparian areas. General technical report RMRS-GTR-47. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Ogden, UT. 49 pages.

Yolo Natural Heritage Program. (2009). *Draft species accounts* (Accessed on March 12, 2010). Woodland, CA: Yolo Habitat Joint Powers Agency. Retrieved from: http://www.yoloconservationplan.org/species.html.

Zoellick, B. W., Harris, C. E., Kelly, B. T., O'Farrell, T. P., Kato, T. T. & Koopman, M. E. (2002). Movements and home ranges of San Joaquin kit foxes (Vulpes macrotis mutica) relative to oil-field development. *Western North American Naturalist, 62*(2), 151–159.

Appendix A – Figures

MERCED COUNTY

MADERA COUNTY

FRESNO COUNTY

SAN BENITO COUNTY

MONTEREY COUNTY

Hollister

Ridgemark

Gonzales

Soledad

Firebaugh

Mendota

Tranquillity

San Joaquin

Cantua Creek

156

25

101

146

5

33

180

Legend

- County Line
- City Limit
- Project Footprint
- Valley Floor Conservation Lands
- Valadeao Ranch Conservation Lands
- Silver Creek Ranch Conservation Lands

N

0 2 4
Miles

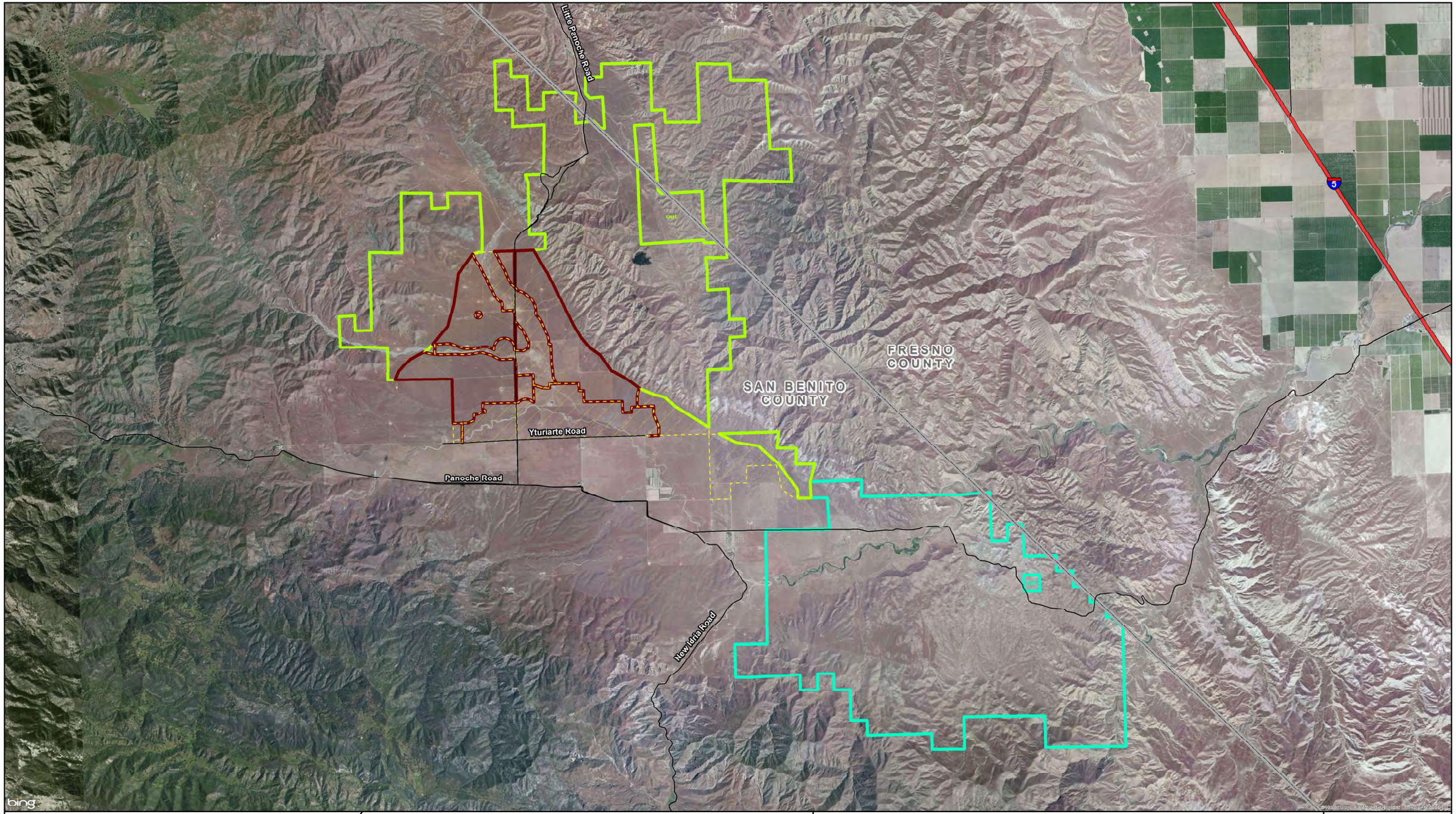
Energy Renewal PARTNERS, LLC

BR
10/15/2013

Duke Energy Renewables
Panoche Valley Solar Project

Project Location

Figure
1



Energy Renewal PARTNERS, LLC

BR
10/15/2013

Legend

- Project Footprint
- Valley Floor Conservation Lands
- Valadeao Ranch Conservation Lands
- Silver Creek Ranch Conservation Lands

N

0 3,500 7,000
Feet

Duke Energy Renewables
Panoche Valley Solar Project

Action Area

Figure
2

FRESNO COUNTY

SAN BENITO COUNTY

Little Panoche Road

Yturiarte Road

Panoche Road

Legend

- Project Footprint
- Valley Floor Conservation Lands
- Introduced Annual Grassland
- Wash/Drainage/ Seasonal Stream
- No Data
- Vernal Pool
- Stock Pond

N

0 625 1,250 2,500

Feet

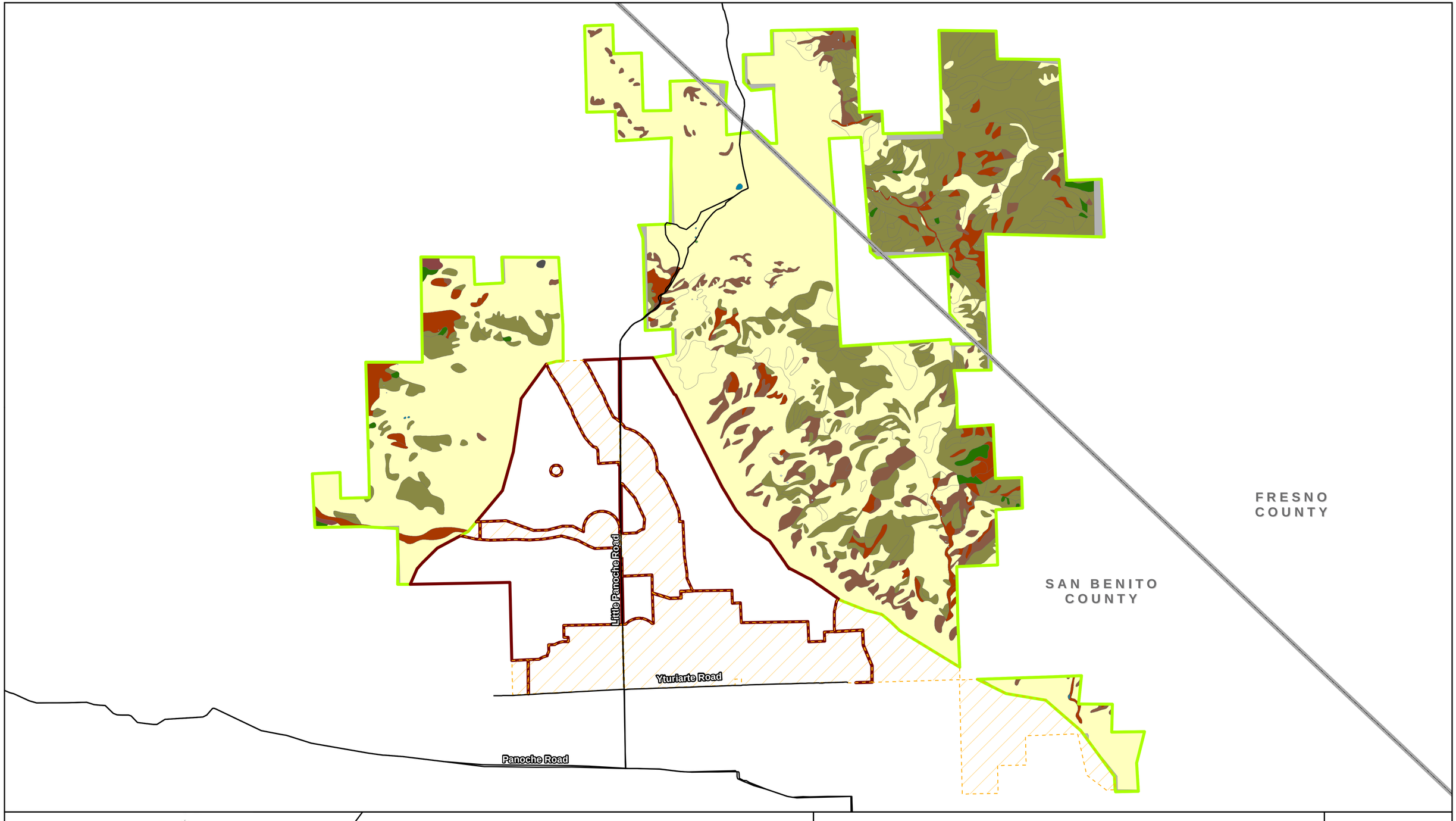
Energy Renewal PARTNERS, LLC

BR
10/15/2013

Duke Energy Renewables
Panoche Valley Solar Project

Project Footprint and
Valley Floor Conservation Lands Biotic Habitats

Figure
3



Energy Renewal
PARTNERS, LLC

BR
10/17/2013

Legend

- Valadeao Ranch Conservation Lands
- Project Footprint
- Valley Floor Conservation Lands
- No Data
- Introduced Annual Grassland
- Wash/Drainage/ Seasonal Stream
- Vernal Pool
- Pond
- Mechanically Disturbed
- Barrens
- Ephedra Shrublands
- Saltbrush Shrublands
- Juniper Woodlands
- Oak Woodlands

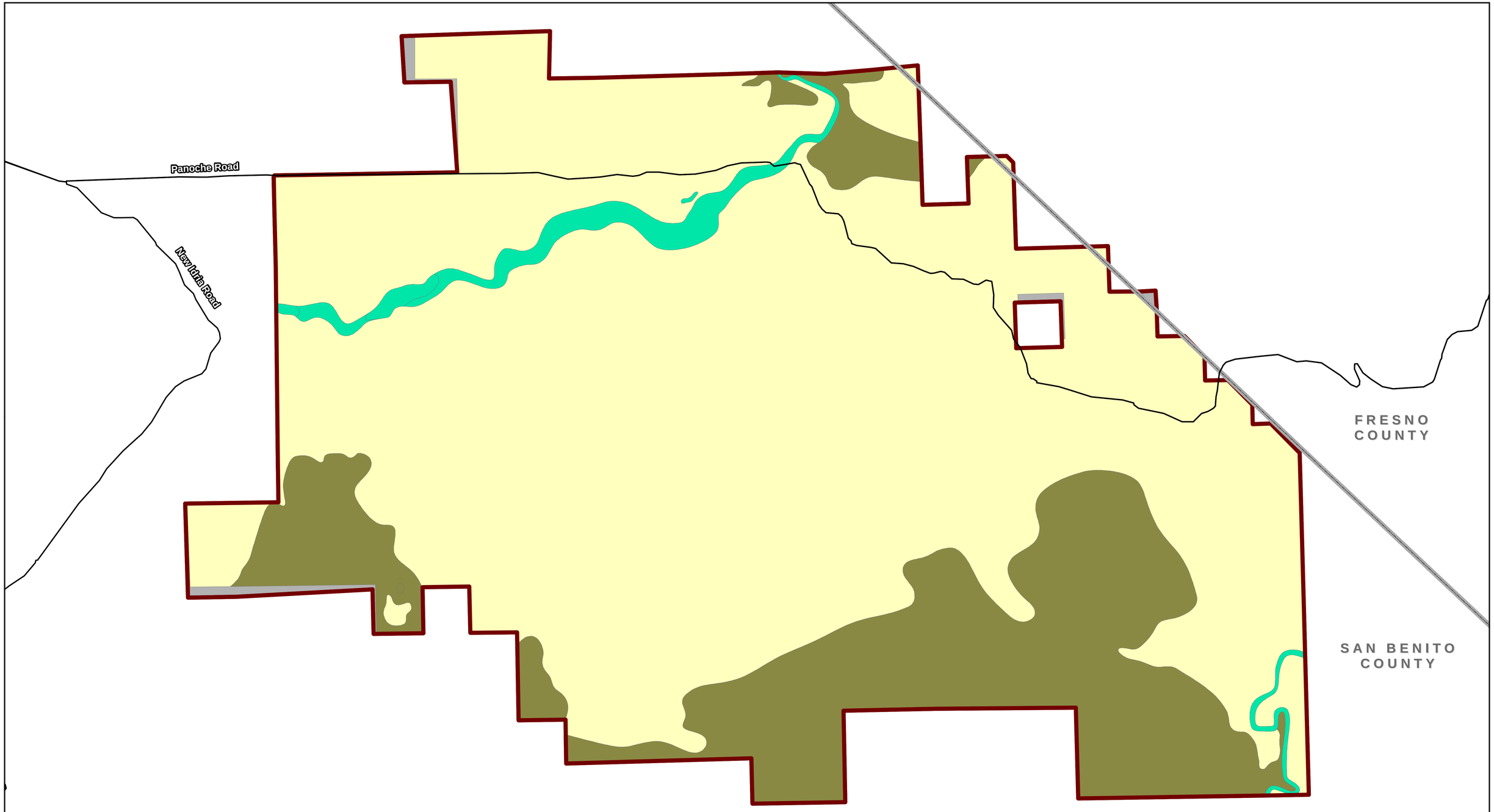
N

0 1,000 2,000 4,000
Feet

Duke Energy Renewables
Panoche Valley Solar Project

Valadeao Ranch Conservation Lands Biotic Habitats

Figure
4



Energy Renewal
PARTNERS, LLC

BR
10/15/2013

Legend

- Silver Creek Ranch Conservation Lands
- Introduced Annual Grassland
- Wetlands and Associated Habitats
- Ephedra Shrublands
- No Data

N

0 625 1,250 2,500
Feet

Duke Energy Renewables
Panoche Valley Solar Project

Silver Creek Ranch Conservation Lands
Biotic Habitats

Figure
5

MERCED COUNTY

SAN BENITO COUNTY

MONTEREY COUNTY

MADERA COUNTY

FRESNO COUNTY

Firebaugh

Mendota

Kerman

Tranquillity

San Joaquin

Cantua Creek

5

33

180

25

146

269

Energy Renewal PARTNERS, LLC

BR
10/16/2013

Legend

- Project Footprint
- County Line
- City Limit
- Mitigation Lands
- BLM Land
- Ciervo-Panoche Natural Area

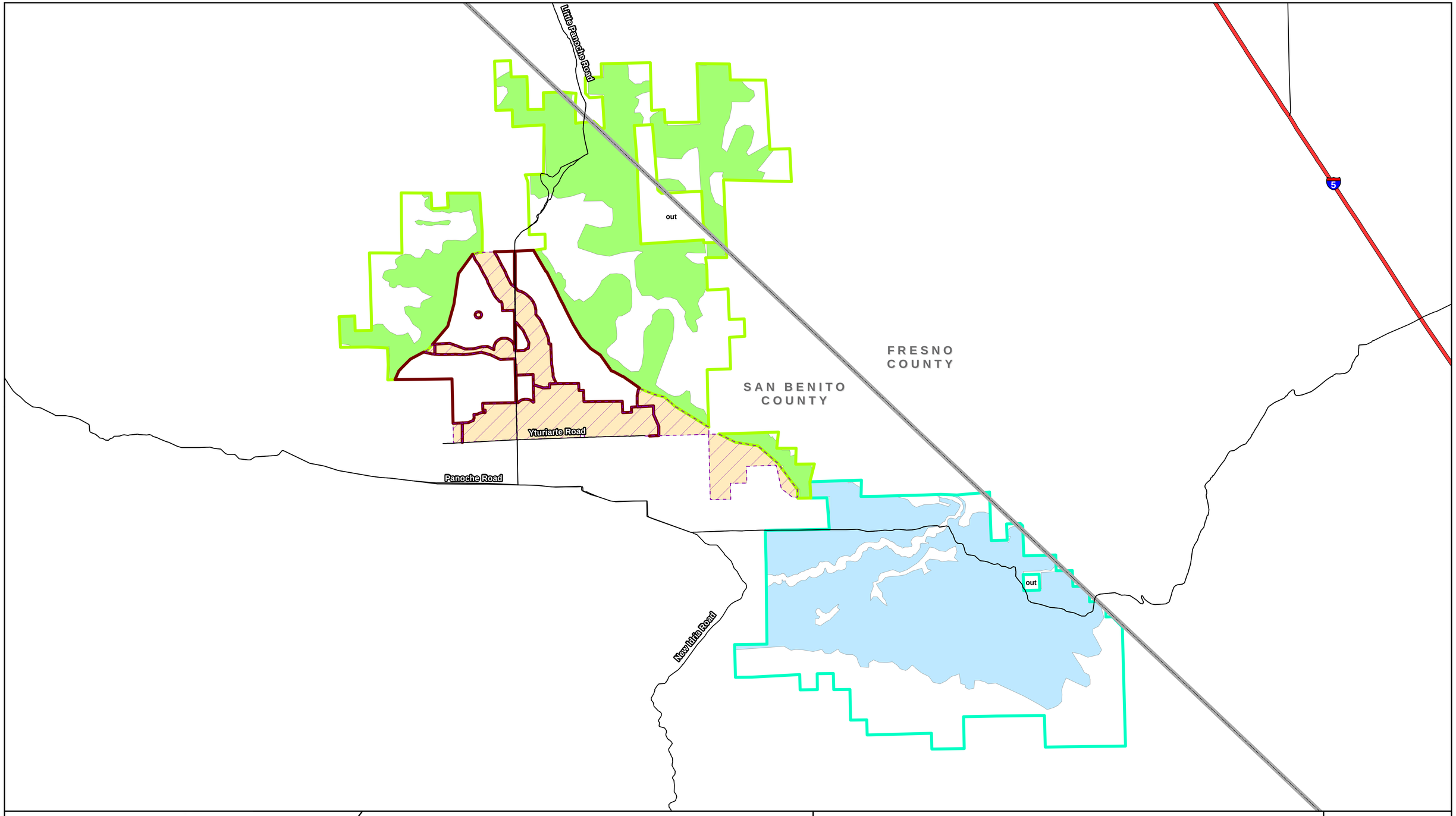
N

0 2 4
Miles

Duke Energy Renewables
Panoche Valley Solar Project

Ciervo-Panoche Natural Area

Figure
6



Energy Renewal PARTNERS, LLC

BR
11/4/2013

Legend

- Project Footprint
- Valley Floor Conservation Lands
- Valley Floor Suitable Habitat (approx 2,517 acres)
- Valadeao Ranch Conservation Lands
- Valadeao Ranch Suitable Habitat (approx 6,611 acres)
- Silver Creek Ranch Conservation Lands
- Silver Creek Ranch Suitable Habitat (approx 7,151 acres)

N

0 3,500 7,000
Feet

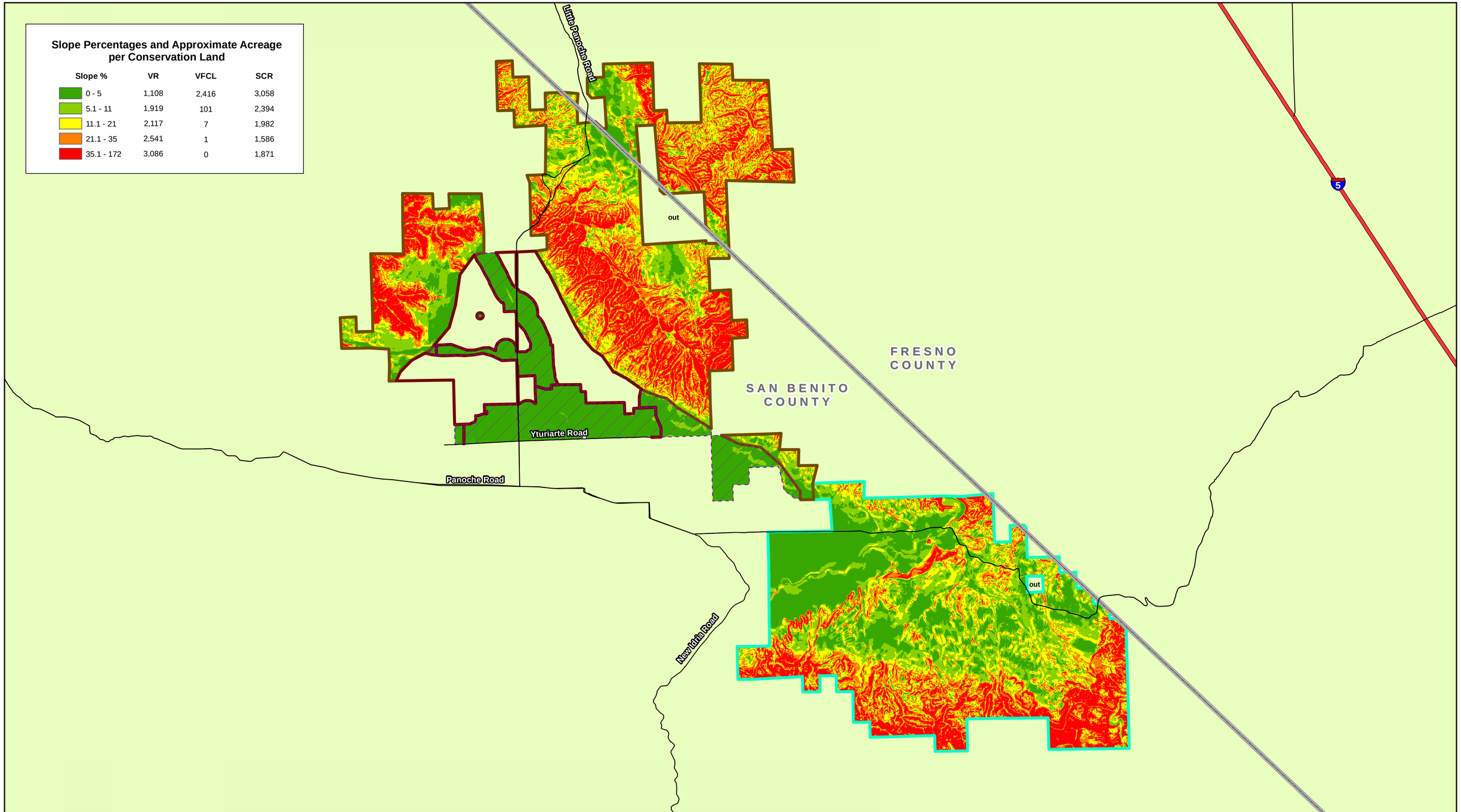
Duke Energy Renewables
Panoche Valley Solar Project
Giant Kangaroo Rat Mitigation Lands*

*For the purpose of this figure, data from Live Oak Associates was used for the Valadeao and Silver Creek Ranches, and clipped to the boundaries as shown. Locations with a slope between 0 and 11% were used for the Valley Floor Conservation Lands.

Figure
7

Slope Percentages and Approximate Acreage per Conservation Land

Slope %	VR	VFCL	SCR
0 - 5	1,108	2,416	3,058
5.1 - 11	1,919	101	2,394
11.1 - 21	2,117	7	1,982
21.1 - 35	2,541	1	1,586
35.1 - 172	3,086	0	1,871



Energy Renewal PARTNERS, LLC

BR
10/21/2013

Legend

- Project Footprint
- Valley Floor Conservation Lands
- Valadeao Ranch Conservation Lands
- Silver Creek Ranch Conservation Lands

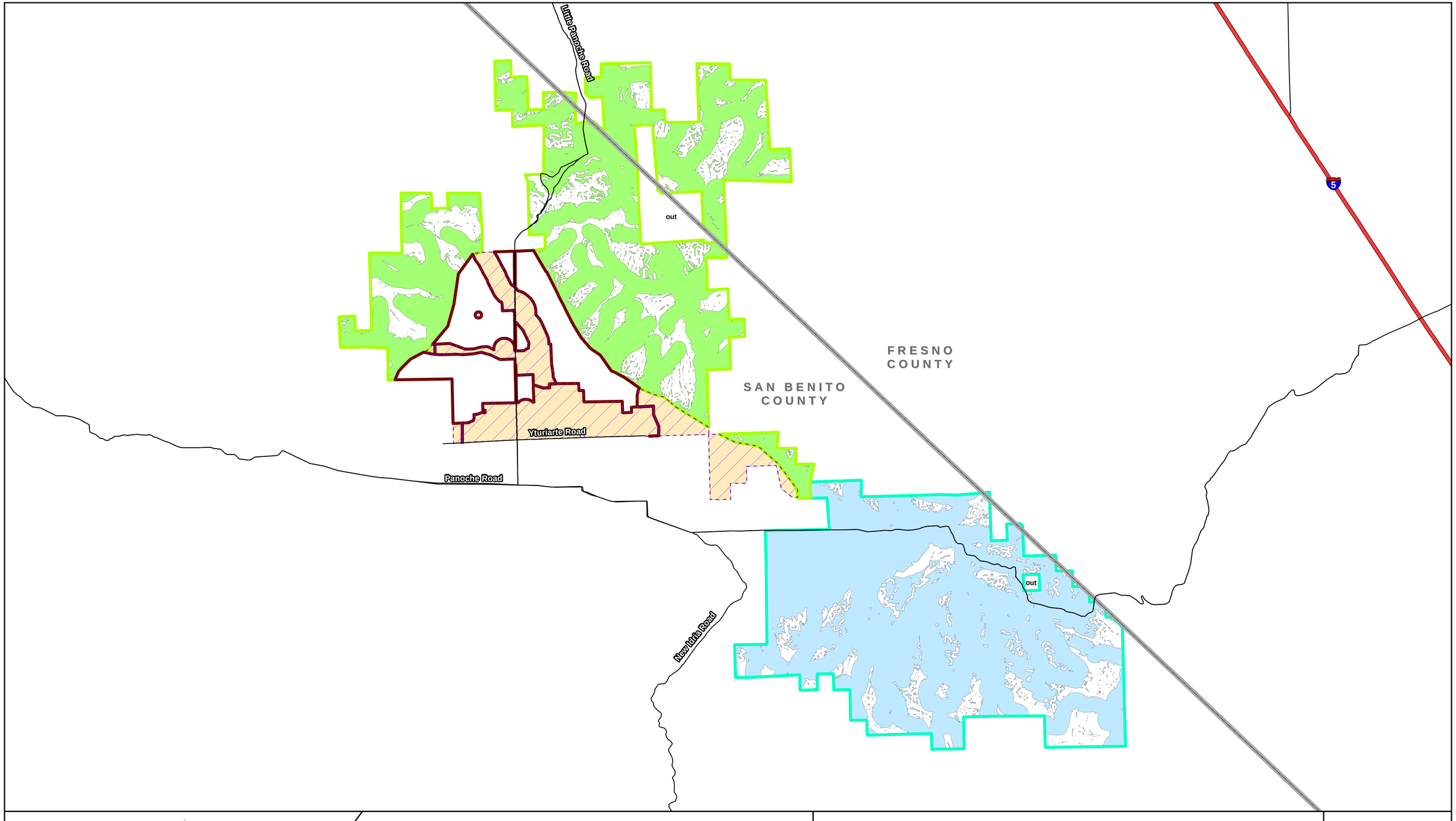
N

0 3,500 7,000
Feet

Duke Energy Renewables
Panoche Valley Solar Project

San Joaquin Kit Fox Mitigation Lands

Figure
8



Energy Renewal PARTNERS, LLC

BR
10/21/2013

Legend

- Project Footprint
- Valley Floor Conservation Lands
- Valley Floor Suitable Habitat (approx 2,517 acres)
- Valadeao Ranch Conservation Lands
- Valadeao Ranch Suitable Habitat (approx 7,876 acres)
- Silver Creek Ranch Conservation Lands
- Silver Creek Ranch Suitable Habitat (approx 8,824 acres)

N

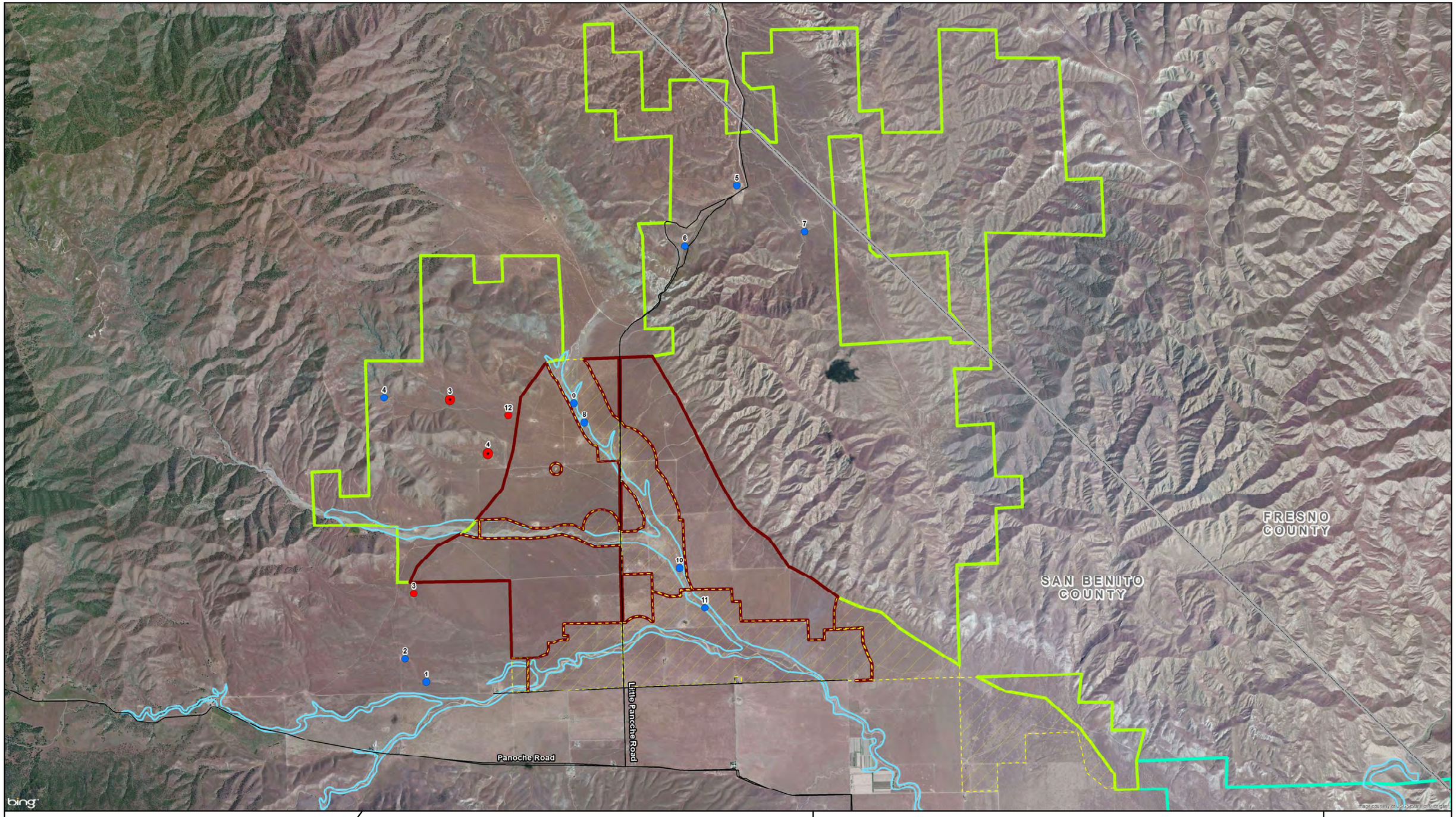
0 3,500 7,000
Feet

Duke Energy Renewables
Panoche Valley Solar Project

Blunt-nosed Leopard Lizard Mitigation Lands*

*For the purpose of this analysis, locations with a slope between 0 and 11% or within 625' of an area of drainage are considered suitable BNLL habitat.

Figure
9



Energy Renewal PARTNERS, LLC

BR
10/16/2013

Legend

- Project Footprint
- Valley Floor Conservation Lands
- Valadeao Ranch Conservation Lands
- Silver Creek Ranch Conservation Lands
- Potential Mitigation Pond Location
- Surveyed Breeding Pond
- Surveyed Pond
- 100-year Floodplain

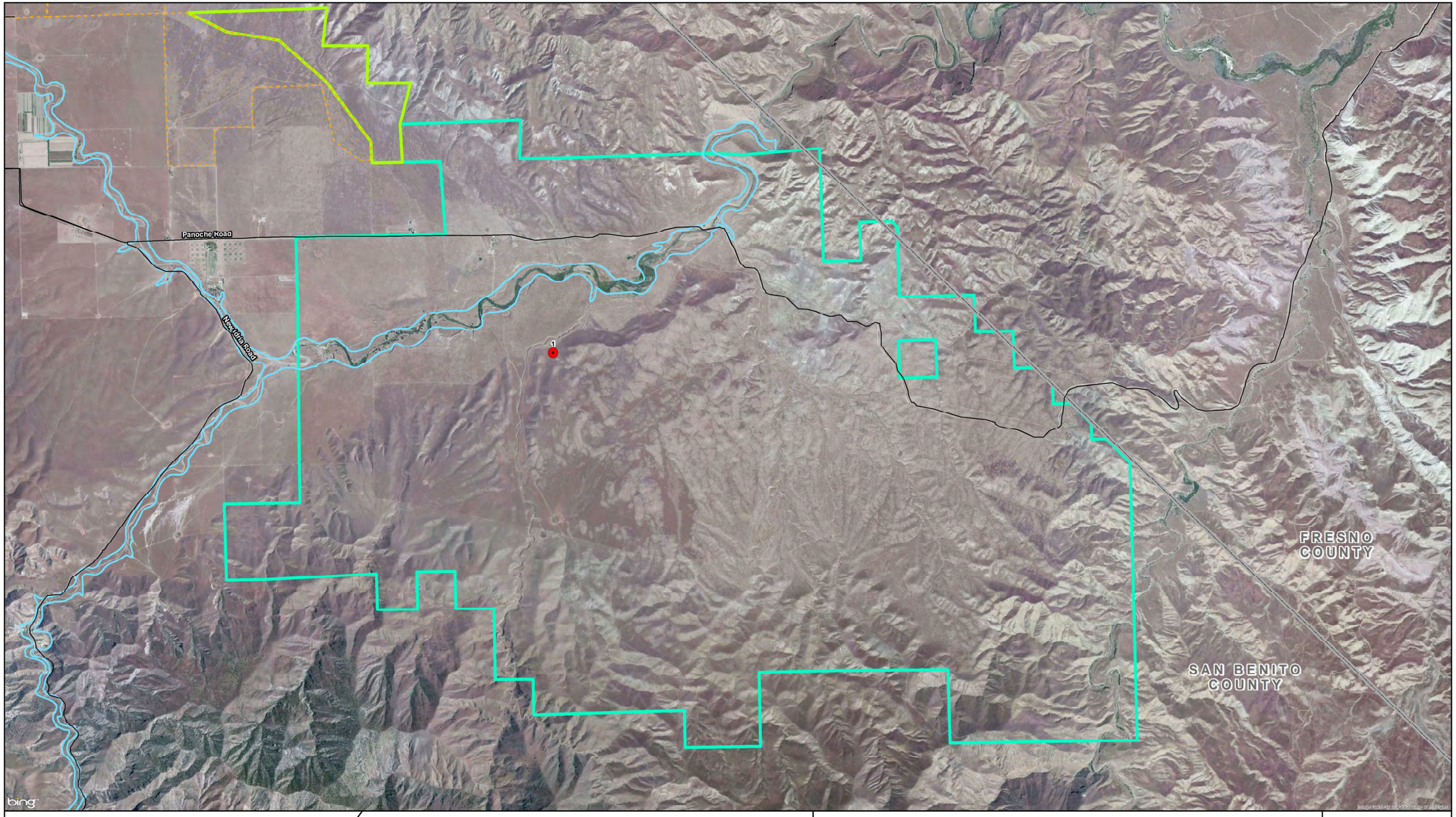
N

0 1,000 2,000 4,000
Feet

Duke Energy Renewables
Panoche Valley Solar Project

Valadeao Ranch Conservation Lands
California Tiger Salamander Potential Mitigation Ponds

Figure
10



Energy Renewal PARTNERS, LLC

BR
10/16/2013

Legend

- Silver Creek Ranch Conservation Lands
- Valadeao Ranch Conservation Lands
- Valley Floor Conservation Lands
- Potential Mitigation Pond Location
- 100-year Floodplain

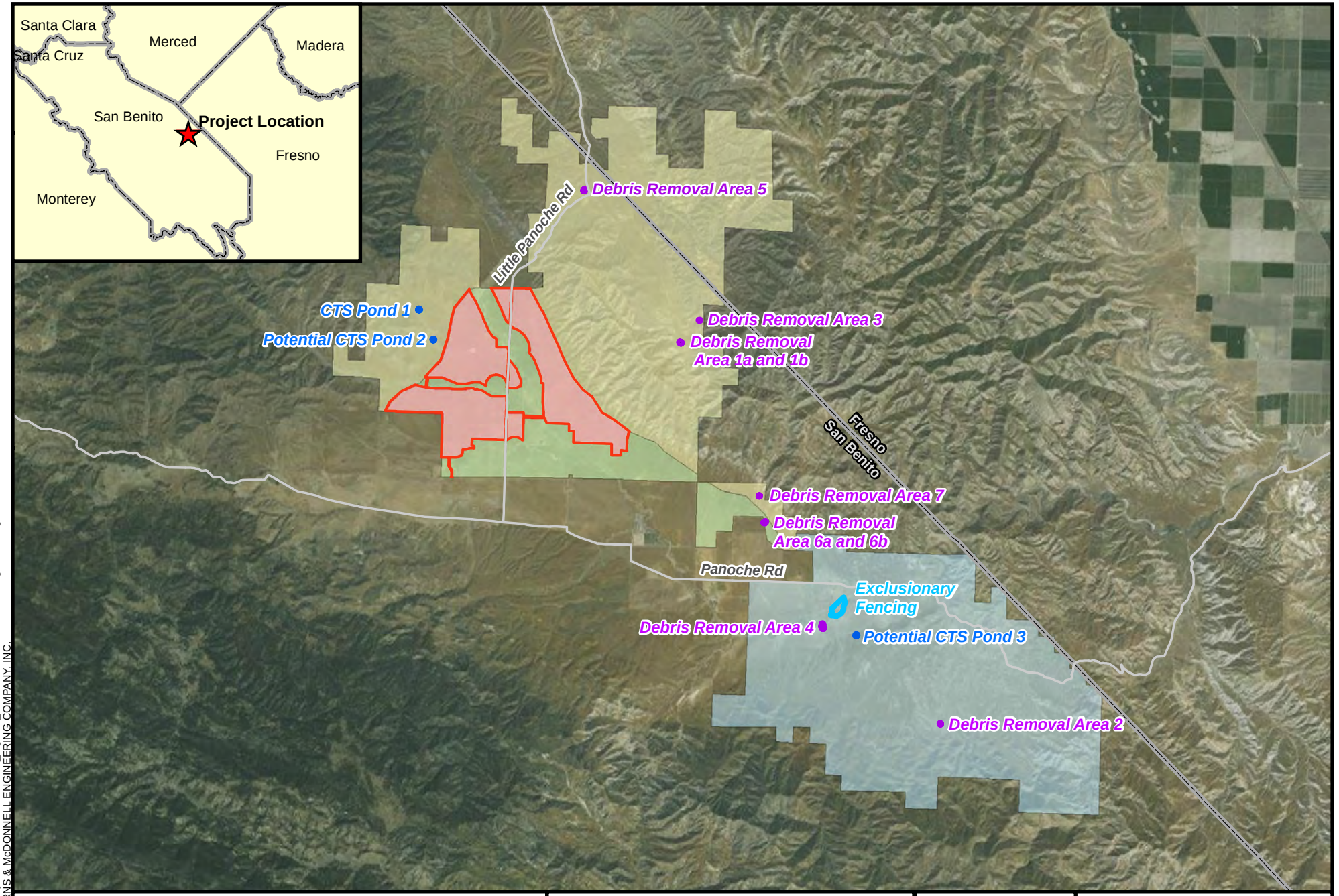
N

0 1,500 3,000
Feet

Duke Energy Renewables
Panoche Valley Solar Project

Silver Creek Ranch Conservation Lands
California Tiger Salamander Potential Mitigation Ponds

Figure
11



LEGEND

- Exclusionary Fencing
- Streets
- County Boundary
- CTS Areas
- Debris Removal Area
- Project Area
- Silver Creek Ranch
- Valley Floor
- Valadeao Ranch

0 1 2 4 Miles

N

Source: ESRI and Burns & McDonnell Engineering.

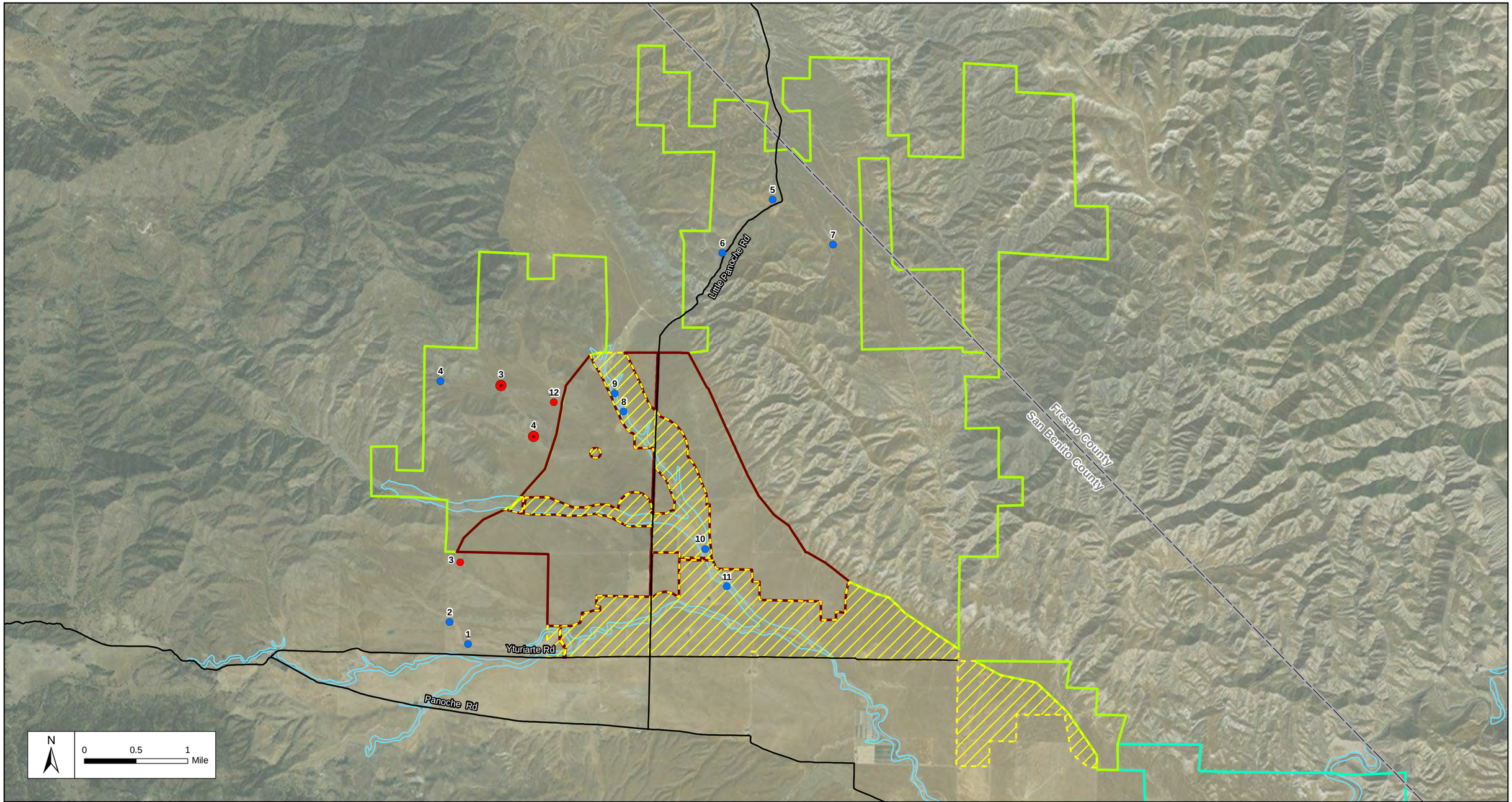
BURNS McDONNELL

Figure 12

MITIGATION AREAS OVERVIEW

Path: G:\ESP\PanocheValleySolar\80258\Records\GIS_Figures_Photos\DataFiles\ArcDocs\Figure 4 Mitigation Areas Overview.mxd

Issued: May 29, 2015 elaine



305 Camp Craft Road, Suite 575
West Lake Hills, Texas 78746
512-222-1125
www.energyrenewalpartners.com
Energy Renewal
PARTNERS, LLC

Legend

- Project Footprint
- Valley Floor Conservation Lands
- Valadeao Ranch Conservation Lands
- Silver Creek Ranch Conservation Lands
- Potential Mitigation Pond Location
- Surveyed Breeding Pond
- Surveyed Pond
- 100-Year Floodplain

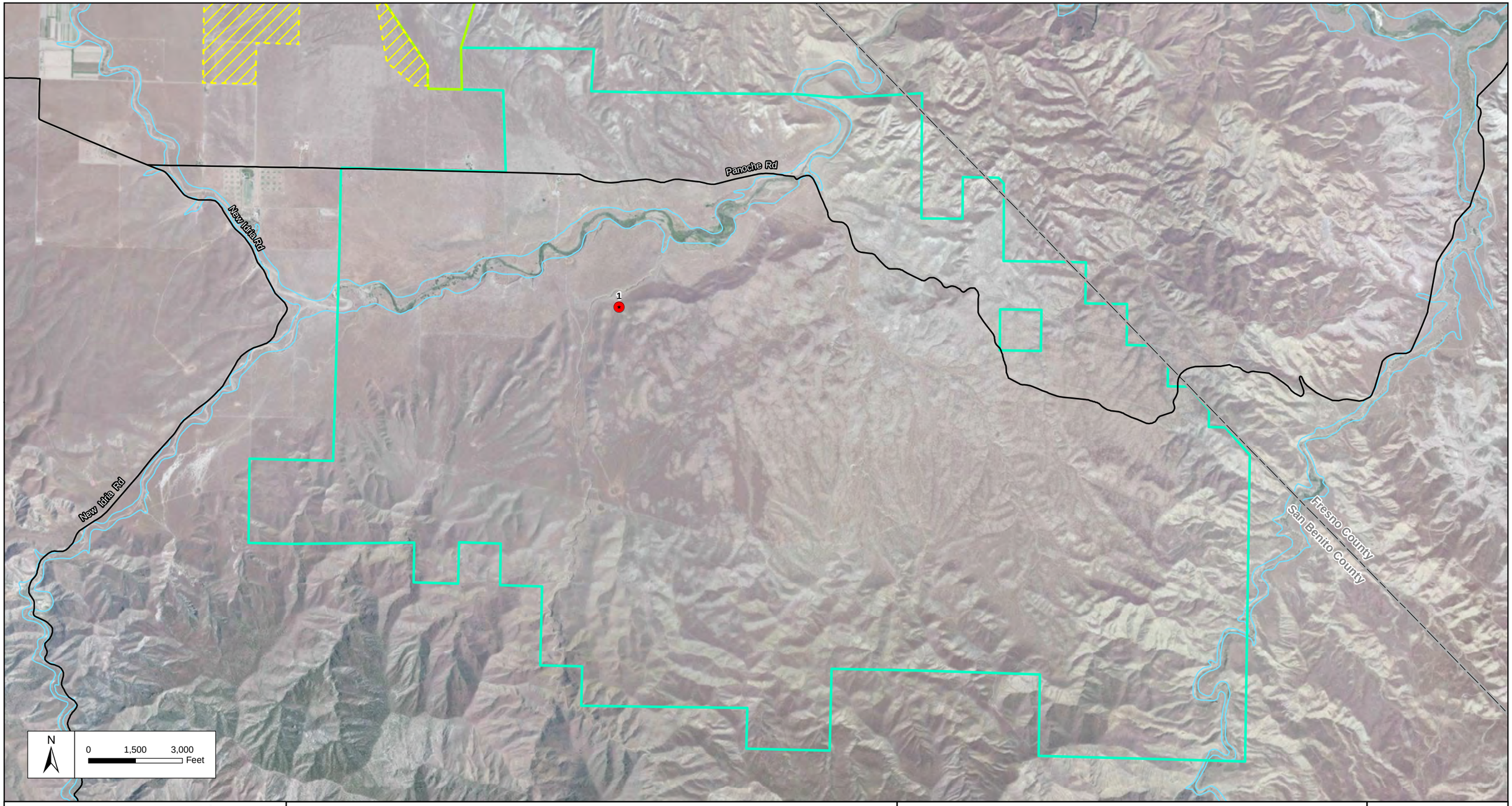
Panoche Valley Solar Project

Valadeao Ranch Conservation Lands
California Tiger Salamander Potential Mitigation Ponds

FIGURE

13

JH 2015-05-29



305 Camp Craft Road, Suite 575
West Lake Hills, Texas 78746
512-222-1125
www.energyrenewalpartners.com
Energy Renewal
PARTNERS, LLC

Legend

- Silver Creek Ranch Conservation Lands
- Valadeao Ranch Conservation Lands
- Valley Floor Conservation Lands
- Potential Mitigation Pond Location
- 100-Year Floodplain

Panoche Valley Solar Project

Silver Creek Ranch Conservation Lands
California Tiger Salamander Potential Mitigation Ponds

FIGURE

14

JH 2015-05-29

Appendix B – Biotic Habitat Detail

Appendix B

Biotic Habitat Descriptions

1.0 Biotic Habitats

1.1 Annual Grassland

The most widespread and dominant species are annual grasses; non-native herbaceous species are distributed more patchily. Species present in the Introduced Annual Grasslands include ripgut brome (*Bromus diandrus*), soft chess (*Bromus hordeaceus*), red brome (*Bromus madritensis*), foxtail barley (*Hordeum murinum* ssp. *leporinum*), and rat-tail fescue (Vulpia myuros). Dominant forbs included broad-leaved filaree (Erodium botrys), red-stemmed filaree (*Erodium cicutarium*), shining peppergrass (*Lepidium nitidum* var. *nitidum*), and vinegarweed (*Trichostema lanceolatum*). Fiddleneck (*Amsinckia menziesii*), devils lettuce (*Amsinckia tessellata*), shepherds purse (*Capsella bursa-pastoris*), turkey mullien (*Eremocarpus setigerus*), and bur clover (*Medicago polymorpha*) were also common, especially along ranch roads. Native species that maintain a presence must be generally tolerant of grazing and saline clay-rich soils. Areas which have not been previously disturbed by historic cultivation or been subject to heavy grazing also include a variety of native wildflowers such as blow wives (*Achyrachaena mollis*), blue dicks (*Dichelostemma capitatum*), California gold fields (*Lasthenia californica*), yellow daisy tidy-tips (*Layia platyglossa*), and California creamcups (*Platystemon californicus*).

Grasslands dominate the lower slopes and valley bottoms in continuous stands that are interrupted only by a few larger washes. Some grassland patches were entirely comprised of non-native species, though these areas were uncommon. One plant on the California Native Plant Society (CNPS) California Rare Plant Rank 4 species list, the serpentine leptosiphon (*Leptosiphon ambiguous*), was identified in this alliance. The VFCL and Project Footprint are almost completely composed of Introduced Annual Grasslands.

On the SCRCL, grasslands occur primarily on the lower slopes of the Griswold and Panoche Hills and valley bottoms, and are largely composed of non-native annuals. Grassy cover was seldom observed to exceed 20 percent, giving the area a sparsely vegetated, somewhat desert-like appearance. In years where precipitation is not as generous as experienced in 2010, much of the area classified as Grasslands may appear to be relatively barren of plants.

On the Valadeao Ranch Conservation Lands, grasslands dominate the lower slopes and valley bottoms in continuous stands that are interrupted only by a few larger washes. Up to 100 percent of the short grass plant association may be non-native, but this situation was patchy and uncommon in 2010. One plant on the CNPS California Rare Plant Rank 4 species list, the serpentine leptosiphon, was identified in this alliance.

1.2 Ephedra Shrublands

Plant associations that were noted to occur within the Ephedra Shrublands include *Artemisia californica*- Senecio flaccidus scrub, *Eastwoodia elegans* - Ephedra californica scrub, *Ericameria linearifolia* - Ephedra californica scrub*, Ericameria linearifolia* - Ericameria nauseosa scrub, *Ericameria linearifolia* - Gutierrezia californica scrub, *Eriogonum fasciculatum* var. *polifolium* - Artemisia californica scrub, *Eriogonum fasciculatum* var. *polifolium* - Ephedra californica scrub, *Eriogonum fasciculatum* var. *polifolium* - Gutierrezia californica scrub, *Eriogonum fasciculatum* var. *polifolium* - Yucca whipplei scrub, and *Gutierrezia californica* - Ephedra californica scrub. Most shrub species in this alliance were widespread at low frequencies in areas beyond the extent of the assemblage where it dominates. In the understory layer, introduced annual grasses generally attain overwhelming dominance. The understory assemblage is often sparse, and non-diverse cover is typical of all study area shrublands associations that occupy xeric, steep slopes with southern aspect, although some associations in this alliance had dense understory. Other notable plants found within this alliance included introduced grasses, coyote brush (*Baccharis pilularis*), silver lupine (*Lupinus albifrons*), narrow leaf milkweed (*Asclepias fascicularis*), Sandberg bluegrass (*Poa secunda*), crinkled onion (*Allium crispum*), white fiestaflower (*Pholistoma membranaceum*), foothill larkspur (*Delphinium hesperium* ssp. *pallescens*), and wild oats (*Avena* sp.) Native perennial species were generally sparse in this alliance. Two plants on the CNPS California Rare Plant Rank 4 species list were observed within this alliance: the naked buckwheat (*Eriogonum nudum* var. *indictum*) and the Santa Clara thorn mint (*Acanthomintha lanceolata*). The transition zone between the Ephedra alliance of hillsides and the Introduced Annual Grassland alliance typical of lowlands was observed to be extensive and broad. This habitat is not present on the VFCL or Project Footprint.

On the SCRCL, plant associations that were noted to occur within the Ephedra Shrublands include *Eriogonum fasciculatum* – Ephedra californica scrub, *Eastwoodia elegans* – Ephedra californica scrub, *Gutierrezia californica* – Ephedra californica scrub, *Ericameria linearifolia* – Ephedra

californica scrub, and *Eriogonum fasciculatum* – Hesperoyucca whipplei scrub. Typically, the upland shrub assemblage at the SCRCL is neither dense nor diverse. Total shrub canopy cover exceeds five percent only in patch- scale stands. The most evenly and widely distributed species, Ephedra californica, also forms often expansive, monospecific overstories of less than two percent absolute shrub cover, which were classified within the area mapped as Grasslands.

On the VRCL, Ephedra Shrublands occur in Las Aquilas Creek, an arroyo-like wash at the southwestern edge of the VRCL, in small patches along ridgelines, steep slopes with a northern aspect, lower slopes, along ephemeral drainages, and steep rocky and thin-soiled south-facing slopes. Most shrub species in this alliance were widespread at low frequencies in areas beyond the extent of the assemblage where it dominates. In the understory layer, introduced annual grasses generally attain overwhelming dominance. The understory assemblage is often sparse, and non-diverse cover is typical of all study area shrubland associations that occupy xeric, steep slopes with southern aspect, although some associations in this alliance had dense understory.

Other shrubland association canopy dominants are present in this zone at very low frequencies or in small, highly grazed patches. It is likely the position of this transition is maintained by long-standing patterns of range cattle grazing. Mature *E. californica* are apparently among the least palatable shrubs available to cattle, but recruitment of this species was seen only rarely where the populations occupied lowland areas mapped as Introduced Annual Grasslands. In contrast, diversity is much greater (especially among native species) where Introduced Annual Grasslands occupy shrubland canopy gaps on the more remote, upper slopes of the VRCL.

Ephedra shrublands within the VRCL range from nearly pure California ephedra (*E. californica*) stands to highly diverse associations with typical desert shrubs. Occupied habitats occur from lower slopes and valley bottoms to rocky outcrops and alluvial slopes. This 3 to 15 foot tall shrub rarely achieves greater than 10 percent cover (absolute), but the cover provided varies little with soil type, aspect, or grazing pressure. It is generally the only shrub present in the often very broad transition from Ephedra shrublands to Introduced Annual Grasslands.

The Ephedra alliance is more prevalent to the east of Little Panoche Road. There is evidence that it was more widespread on the western face of the Panoche Hills prior to a widespread fire that swept this area within the last decade, leaving many large *E. californica* stumps. Otherwise, all associations that were mapped in this alliance exhibit relatively undisturbed canopy development

have not been recently burned and due to landscape ruggedness, have not received heavy grazing pressure.

1.3 Barrens

Barrens are ridgeline and south or (rarely) west-facing very steep slopes that exhibit a precipitous drop- off in vegetative cover. In terms of vegetation, the assembled species diversity is very low, nearly all species are relatively short-lived annuals, shrubs and trees are absent, and introduced annual grasses become minor components of the species mix. Barrens most commonly interrupt Introduced Annual Grasslands, where the transition was often observed to occur over the space of several feet. Barrens that interrupt shrublands alliance vegetation are less common, but were found to support occurrences of rare plant populations more often than any other mapped association. Botanical surveys conducted in the Panoche Valley and Panoche Hills suggest that Barrens habitats, while comparatively lacking in total cover, can support assemblages with greater native character, and can include rare species. Large patches of bare soil were commonly evident within barrens polygons mapped in 2010. Given that barrens are an exclusively annual collection of species, it seems likely that their aerial extent is variable, dependent on local rainfall amounts and the spacing of storm events. In comparatively dry years, it is conceivable that barrens extents could be expressed at up to twice the area mapped in 2010. Aerial photographs dated September 2008 consistently indicate greater barrens extents, especially on the lower western slope of the Panoche Hills immediately above the Project Footprint. This habitat is not present on the VFCL.

On the SCRCL, areas classifiable as true "Barrens" are commonly embedded within Grasslands on south- facing aspects and on ridge areas, in both the Griswold and Panoche Hills. In relatively dry years, Barrens supporting less than one percent total cover may be expressed across as much as 30 percent of the area mapped as Grasslands on the SCRCL.

On the VRCL, two plant associations were identified within the barrens: *Erodium cicutarium* - *Plantago erecta* and *Holocarpha obconica* - *Vulpia macrostachys*. Barrens total cover rarely exceeds one percent on the VRCL. Members of the relatively sparse barrens assemblage are adapted to some of the harshest habitat available within the study area. Low cover may be resultant at least in part from low soil moisture retention and from erosion and use by rodents. The ridgeline and southern aspects are exposed to intense drying from sun and wind and are very

steep. The soil surface appears to be highly eroded and ground creep is evident. This habitat appears to be attractive to burrowing rodents, whose grazing and digging further affect plant cover. Finally, transitions to barrens are accompanied by a clear change in soil color; barrens can be grouped into "red," "blue-grey," and "white" clay soil types. Adjacent slopes of similar aspect and steepness but lacking these unusually colored soils support typical (dense and tall) stands of Introduced Annual Grasslands or Ephedra alliance vegetation, suggesting a soil toxicity that may be inherent to the bands of red, blue-grey, and white clays. Plants occurring in barrens on the VRCL include the introduced annual herb *E. cicutarium*, and native *P. erecta, Blepharizonia laxa, Monolopia* spp.*, Phacelia tanacetifolia, Salvia columbariae*, and *Camissonia boothii*. Two plants on the CNPS California Rare Plant Rank 4 species list, the naked buckwheat (*Eriogonum nudum* var. *indictum*) and the benitoa (*Benitoa occidentalis*), and one plant on the CNPS California Rare Plant Rank 2 species list, the California groundsel (*Senecio aphanactis*) were also identified in this alliance on the VRCL.

1.4 Saltbush Shrubland Alliance

Saltbush shrubland within the study area consists of nearly pure to species depauperate mixed stands of saltbush associations. Occupied habitats range from white clay soils on hills immediately west of Little Panoche Road to rocky outcrops and alluvial slopes experiencing high ground creep rates near ridgelines east of the road. In all observed occurrences on hills, the aspect of greatest *A. polycarpa* cover is southern. This two to three foot tall shrub also attains dominance within several of the ephemerally flooded washes, where sandier soils are more common. It is always the most common shrub canopy contributor near seasonal springs and seeps that exhibit saline character. This habitat is not present on the VFCL, Project Footprint, or on SCRCL.

Two associations within the saltbush shrubland alliance exist on the VRCL: *Atriplex polycarpa - Eriogonum fasciculatum* var. *polifolium* and *Atriplex polycarpa - Isocoma acradenia* var. *bracteosa*. *Atriplex polycarpa - Eriogonum fasciculatum* var. *polifolium* occurs on slopes, appearing as mainly open ground with scattered shrubs. Shrub canopy closure averages five to 10 percent, with scattered clumps of 20 percent closure. Canopy density is greatest on south-facing slopes, where *E. fasciculatum* is often more prevalent, and on slopes that are steep or slippery enough to exclude grazing. The herbaceous layer is largely absent, resembling barrens (described below) that are often present on adjacent slopes of similar aspect. Native character is thus relatively high, and undisturbed habitat (i.e., ungrazed) is available for potentially occurring rare

plant species that are associated with saline soil. *Atriplex polycarpa - Isocoma acradenia* var. *bracteosa* occurs in the channel bottoms of ephemerally watered washes and very narrowly along the adjacent slope bases. All channels in which this association occurs also hold one or more ephemeral or seasonal springs that exhibit saline character, and exhibit sandy soils that are somewhat atypical of the clay-dominated hill and valley soils of the study area. Shrub canopies are confined to wash edges due to trampling by range cattle, and average cover rarely exceeds 10 percent. The riparian corridor is thus normally rather indistinct in structure relative to the surrounding scrub, but the shift in species is consistent and sharply bounded. It is likely that this association was once and would become more widespread in ephemeral wash habitat in the absence of cattle use. But *A. polycarpa* appears to be highly palatable, and use by livestock in this steep and xeric landscape is concentrated in wash habitats.

1.5 Juniper Woodlands Alliance

Juniper woodlands within the study area occur only on north-facing slopes of moderate steepness. Rocky outcrops and talus, which are commonly prominent in the study area's shrublands alliances, are absent from woodlands habitat. Finally, the area's woodlands are rather sparsely treed, and share a common understory assemblage with shrublands (mainly introduced annual grasses), yet are noticeably devoid of a significant shrub layer.

The ecotones with adjacent shrub associations are often visually distinct, appearing as a sudden loss of the tree canopy. Individual J. californica rarely exceed 15 feet in height. Girths of up to 20 inches diameter at breast height suggest that most of the trees in all occurrences have aged enough to be called "mature". The tree population structure, furthermore, appears to be skewed toward older trees, and recruitment was not apparent. It is possible recruitment has been excluded by grazing cattle, as the gentler slopes occupied by this association do not exclude cattle use for grazing and shading. It is apparent from old stumps that trees of narrower girth have been harvested. Both occurrences east of Little Panoche Road were clearly larger in extent prior to harvest, and the older fence posts in these areas appear to be rough juniper. This habitat is not present on the VFCL, Project Footprint, or on SCRCL.

The Juniper woodlands alliance is not common, totaling only 68 acres of the VRCL with all occurrences being less than 16 acres. Two associations within this alliance occur on the VRCL: *Juniperus californica - Ephedra californica* and *Juniperus californica - Ericameria*

linearifolia. The *Juniperus californica - Ephedra californica* association occupies middle elevations of north-facing slopes. *J. californica* canopy cover ranges from 5 to 20 percent. The shrub layer is sparse, and is composed of mainly *E. californica*. Subdominant shrubs include *Ericameria linearifolia*, *Gutierrezia californica*, *Eriogonum fasciculatum*, and *Artemisia californica*. The herbaceous layer is never dense. It is composed mainly of introduced annual grasses, the same assemblage as found within the shrubland associations that dominate the surrounding landscape. The contrast in the shrub and herbaceous layers of adjacent shrublands and woodland associations is likely due to the presence of the trees. *Juniperus californica* patches are the only significant provider of shade across much of the study area, and so are gathering places for range cattle during much or all of the year. As such, trampling and intensified herbivory appear to be important limiting factors for plants that have not reached escape height. Roosting habitat for birds is provided, and evidence was seen of use by other large mammals such as coyote (evidence of deer was not observed anywhere within the study area). It is likely that, in the absence of grazing use, the association would provide habitats for native plant species that require additional shading. The *Juniperus californica- Ericameria linearifolia* association occupies middle to upper elevations of north-facing slopes. On average, canopy closure does not exceed ten percent. Both diversity and abundance of the shrub and understory assemblages are increased noticeably relative to the closely similar *Juniperus californica*.

Ephedra californica association. In all occurrences, *E. linearifolia* achieves higher abundance and cover than other shrubs, including *Ephedra californica*. Greater understory development may be related to the often higher elevation, along with relatively steep slopes occupied by this association, which would tend to limit use by range cattle.

1.6 Oak Woodlands Alliance

Oak woodlands occupy lower slopes and wash edges with northern aspect. They transition upslope to *Juniper californica* woodlands. The oak woodlands were found in the hills west of Little Panoche Road only. The Oak woodlands alliance can be associated with acorn-processing cultural resources. The terrain within the Oak woodlands can be very rough. Steeply banked, tree-shaded gullies were observed to support a higher diversity of native annual and perennial herbs than any other habitat available in the woodland, shrubland, or grassland associations of the study area. This greater diversity likely results from cattle exclusion through rough terrain and fencing. The dependable seasonal shading that is provided by dense canopies of *Q. douglasii* (a winter-

deciduous oak) creates additional microhabitats not available elsewhere, and generates considerably greater soil organic matter accumulation. Productivity and nutrient cycling functions, support of diversity (including wildlife), and arrest of ground creep (talus, gullies, and slides are common in shrublands) are enhanced by the presence of trees. Oak woodlands are absent from the VFCL, Project Footprint and SCRCL even though Oak woodland alliances occur on nearby slopes at similar or higher elevations than the SCRCL.

The *Quercus douglasii - Juniperus californica* association was the only association in this alliance found on VRCL. This association develops the highest tree canopy cover found within the study area, and is starkly evident in the study area's landscape. The association's distribution is limited to two locations mapped with polygons, but each occurrence is relatively large. The occurrence that was mapped at the study area's southwestern corner appears to extend well off-site to the west, and other large examples are visible on Gabilan Range slopes to the west. This woodlands association likely represents the region's most xeric and lowest elevation plant community in which *Q. douglasii* is dominant in this area. One plant on the CNPS California Rare Plant Rank 4 species list, the Salinas milkvetch (*Astragalus macrodon*), was identified in this alliance.

1.7 Wetlands and Associated Habitats

Many wetland types occur on the Conservation Lands. However, most hold water during only part of the year. Wetland and associated habitats include: ephemeral spring or seasonal spring, perennial spring, seasonal stream, wash, drainage, three associations*: Salix laevigata - Sambucus nigra* on perennial springs and *Distichlis spicata* and *Distichlis spicata - Isocoma menziesii var. vernoniodes* on ephemeral/seasonal springs, and riparian habitats consisting of three associations: *Populus fremontii* forest, zonal riparian, and tamarix semi-natural shrublands.

Panoche Creek and Las Aquilas Creek run between portions of the Project Footprint but are contained entirely within the VFCL. They are ephemeral creeks that are dry in the summer. Smaller washes and drainages feed these larger creeks. The Project Footprint supports several seasonally flooded pools and stock ponds, predominantly in the northern portion of the Project Footprint along unnamed washes. Habitat for aquatic species and amphibians within the Project Footprint is limited to the few stock ponds and ephemeral pools. The VFCL support seasonal streams, washes, and drainages, all of which are seasonally wet or wet only during rain events.

On the SCRCL, riparian stands associated with seasonally or perennially moist substrates, including seeps, and springs, appear to be very rare and unevenly distributed within the area. Riparian habitats occur along the Panoche and Silver Creeks. It should be noted that the SCRCL were not surveyed during the wet season, therefore, seasonal seeps and vernal pools onsite may not have been identified during the reconnaissance surveys.

Habitats at springs and seeps would typically support plant species that are dependent on a reliable availability of shallow groundwater to survive the annual drought (May-October), and the vegetation extent would be expected to narrowly adhere to the wetted zone. Plant associations adjacent to these resources, would be subject to continuation of livestock grazing utilized to manage the SCRCL to benefit Covered Species. No flowing springs were found in an upland setting during the September 2010 survey. Evidence of seep zones that provide ephemeral flows and sustained root zone moisture in an upland setting were found only within one relatively deeply incised canyon near the southern survey edge. At the floor of this canyon, a small area of well-developed episalic crust was found at a clear shift from shrublands to dominance by saltgrass (*Distichlis spicata*). Although not all incised features could be viewed in the available time, areas outside the Silver Creek and Panoche Creek riparian zones appeared to convey little runoff during the 2010 wet season.

Silver Creek riparian vegetation, where it briefly intersects the SCRCL, indicates a seasonally wet, somewhat saline habitat subject to annual or occasional energetic flows. The riparian corridor has become dominated by invasive tamarisk (*Tamarix* sp.), and is classified as Tamarix Semi-Natural Shrubland. Tamarisk has developed semi-open to impassable stands in a 30 to 100 foot wide corridor. The population extends well off-site both upstream and downstream. In this area, saltgrass appears to be the native species most tolerant of the soil salination and groundwater drawdown effects of heavy tamarisk infestation, and often forms meadow-like swards between the tamarisk thickets.

Panoche Creek is a gaining reach as it crosses through the SCRCL. The streambed upstream off the site for at least three miles was observed to be completely dry and largely devoid of plants. Within the surveyed area, this arroyo-like habitat quickly transitions to zonal wetlands characterized by gaseous springs, highly reduced soils, and marsh or meadow vegetation. The Panoche Creek riparian zone, which ranges from 100 feet to 500 feet in width, may provide the only reliable, naturally occurring surface water for much of the year. The dominant plants are

consistently arrayed, with vegetation classified as emergent Typha marsh (*Typha* Herbaceous Alliance) centrally, and *Schoenoplectus americanus* mid- marsh (*Schoenoplectus americanus* Herbaceous Alliance) at the outer saturated edge, and *Distichlis spicata* meadow (*Distichlis spicata* Herbaceous Alliance) extending across the moistened to seasonally drying soils at the riparian edge. All riparian zonal alliances within the survey area are patchy, with one or two species at most attaining dominance. Co-occurring with species such as *Frankenia salina* and *Juncus mexicanus*, dominants in these three alliances indicate a somewhat saline and possibly alkaline soil and shallow groundwater environment. Trees are largely absent, as are species adapted to a floating or submerged habitat. A marsh environment that had developed in response to springs with excellent water quality would be expected to support a more diverse assemblage within each alliance, even with pressure from livestock use.

The small area of riparian woodland located south of Panoche Road is, like the *Distichlis* meadow, confined to the first terrace outside the saturated zone. The woodland canopy, classified as a degraded *Populus fremontii* Forest Alliance, reaches about 30 percent closure and includes a significant presence of red willow (*Salix laevigata*) where it is most dense. The stand currently exhibits many mature and dead trees but essentially no recruitment and no understory due to intense livestock use. It is possible that this occurrence, and the marsh and meadow vegetation associated with the Panoche Creek riparian corridor on the SCRCL, are dependent upon annual inputs of relatively fresh water that originate in the upper Griswold Creek and Panoche Creek drainages and serve to flush salts and toxins that accumulate in the topsoil and the plants as evapotranspiration consumes the perennial spring flows.

The VRCL support ephemeral and seasonal seeps and springs, including the *Distichlis spicata* and *Distichlis spicata - Frankenia salina* associations. Ephemeral springs and seasonal springs occurrences are embedded within or adjacent to occurrences of *the Atriplex polycarpa - Isocoma acradenia* var. *bracteosa* association, at ephemeral and seasonal seeps and springs. Dominants occur patchily and sometimes very densely. All occurrences are associated with drying soils (wet just beneath the surface in June) and a moderate to strong development of an evaporative saline soil crust. *A. polycarpa* growing in this association are invariably stunted by the habitat or by unrelenting cattle browsing. Seasonally wet habitats are otherwise rare in the study area. It is certain that native species diversity is enhanced and maintained within these polygons. Species such as *Mimulus guttatus, Spergularia marina,* and *Sueada moquinii* were found in this limited

association and not elsewhere within the study area.

The VRCL also support perennial springs and the *Salix laevigata – Sambucus nigra* association. Three perennial springs intersect the study area near or at its far western edge. All occur in steep, rocky channels at an elevation of about 1,300 feet. Alignment of these springs and of the less persistent seeps in this area suggests fault control of flows. Given the active seismic environment, it is likely expressions of this association are not long-lived in the study area. This hypothesis would be supported by the observations of shrub dominance and general lack of older trees at study area perennial springs. For example, larger willows (*Salix laevigata*) and trees such as Fremont poplar (*Populus fremontii*) that occur at area streams are absent. Native perennial and shrub diversity, however, is greatly enhanced at these features. Cover is multi-layered and approaches 100 percent, providing excellent habitat for wildlife that rely on the surface water.

Ponds constructed to capture any brief flows that occur, such as the ponds observed throughout the hills and valleys on the VFCL and the VRCL, were largely absent from drainages on the SCRCL; two constructed ponds were identified on the SCRCL. Rather, constructed water tanks and troughs for livestock are more common on the SCRCL, as the area appears to be largely devoid of naturally occurring, fresh surface water during the normal dry season.

Vernal pools were located on the VRCL and the VFCL. Reconnaissance surveys on the SCRCL did not locate any vernal pools; however, these surveys were made during the dry season.

1.8 Mechanically Disturbed and Unvegetated

Areas that have been repeatedly or recently disturbed with resulting devegetation are uncommon on all three Conservation Lands and the Project Footprint. Significant disturbance was found only at a few existing farmland structures and in livestock gathering areas that might otherwise support Annual Grasslands vegetation. Roads cross the area very sparsely, and only Little Panoche Road is completely paved while Panoche Road is partially paved. Panoche, Little Panoche, and Ytiarte Roads are open to public use.

2.0 Rare Plant Populations

No federal or state listed plant species were located during Project-level surveys conducted for the Project. In addition, no federal or state listed plant species were located during reconnaissance-level surveys of the VFCL, VRCL and SCRCL.

Six different non-listed rare or sensitive plant species were observed during the survey of plant associations on VFCL, VRCL, and SCRCL. These included Santa Clara thorn mint (*Acanthomintha lanceolata*) (CNPS Rank 4.2), Salinas milkvetch (*Astragalus macrodon*) (CNPS Rank 4.3), benitoa (*Benitoa occidentalis*) (CNPS Rank 4.3), naked buckwheat (*Eriogonum nudum* var. *indictum*) (CNPS Rank 4.2), serpentine leptosiphon (*Leptosiphon ambiguus*) (CNPS Rank 4.2) and California groundsel (*Senecio aphanactis*) (CNPS Rank 2B.2). Santa Clara thorn mint was found on one talus slope on the western edge of the VRCL where the *Eriogonum fasciculatum* - *Artemisia californica* association was identified. Salinas milkvetch was found within *Quercus douglasii – Juniperus californica* woodlands near the northwest corner of the VRCL. The single population of benitoa was located on barrens in the northeast corner of the VRCL. The rare plant species with the greatest number of occurrences was naked buckwheat with 25 separate populations recorded. Populations of this species were found on grassy, north-facing slopes classified here as *Ericameria linearifolia* - *Ephedra californica* association (18 occurrences), Introduced Annual Grasslands association (four occurrences), or *Eriogonum fasciculatum* - *Artemisia californica* (three occurrences). Some populations of naked buckwheat were observed to occur in the thousands. The annual serpentine leptosiphon was detected in grassland on the slopes of northwest Panoche Valley on the VRCL. Two populations of California groundsel were located in barrens habitat classified here either as barrens or as a patchy inclusion in Introduced Annual Grasslands near Little Panoche Road.

3.0 Invasive Plant Species

As is common through much of central and southern California, numerous invasive plants can dominate the landscape. Grasses such as red brome are dominant in the non-native grasslands as well as being a component of the shrub communities in many of the other habitat types on the Project. Other invasives, such as *Erodium cicutarium*, are commonly found but are not as devastating to the historic natural landscape as invasive bromes. Invasive plants out compete native species leading to decreased diversity in the habitat; extirpation of some natives; lower quality forage; and sometimes, increased risk of range fires which can further damage habitats, especially saltbush which do not recover from fire mortality. Many invasive plants are also quick to successional growth giving them an advantage on disturbed habitats where remediation may be desirable.

Of significance in terms of invasive plants is a stand of tamarisk that has developed semi-open to impassable stands in a 30 to 100 foot wide corridor along Silver Creek in the SCRCL. The population extends well off-site both upstream and downstream. Evidence of effects from groundwater drawdown from this species includes soil salination with the native saltgrass forming meadow-like swards between the tamarisk thickets.

Appendix C – Covered Species Detail

Appendix C
Covered Species Descriptions

Blunt-nosed Leopard Lizard (Gambelia sila) (BNLL)

Status and Description:

Legal status – The BNLL is currently listed as endangered by the ESA and endangered by the CESA (Fish and Game Code §§ 2050 et seq.) and it is also a Fully Protected species under California Fish and Game Code Section 5050. The BNLL was originally listed as being in danger of extinction under the Endangered Species Preservation Act of 1966 (32 FR 4001, March 11, 1967), and is currently listed as endangered under the ESA of 1973, as amended. No critical habitat has been designated for the BNLL. The BNLL is included in the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (USFWS 1998).

Species ecology – The BNLL most closely related to the long-nosed leopard lizard (*Gambelia wislizenii*), and was originally thought to be a subspecies. Montanucci (1970) presented solid information for the separation of the two species based upon studies of hybrids between the BNLL and long-nosed leopard lizard. The two species will hybridize where their ranges overlap. Adult male BNLL are larger than females, ranging in size from 8.7 to 12.0 centimeters (cm) in snout-vent length. Total length including the tail can be up to 35.7 cm (Germano and Williams 2005). Adult males weigh between 31.8 and 37.4 grams and adult females weigh between 20.6 and 29.3 grams. BNLL are quite often the largest lizard throughout its range and coloration can vary greatly. Background colors on the dorsal surface can range from yellowish, light gray or dark brown depending on the surrounding soil and vegetation. The ventral surface is uniformly white. The color pattern on the back consists of longitudinal rows of dark spots interrupted by white, cream, or yellow bands. These cross bands can aid in distinguishing the BNLL from other leopard lizards; the cross bands of the BNLL are much broader, more distinct, and extend from the lateral folds on each side of the body. Juvenile BNLL have blood-red spots on the back that darken with age.

BNLL originally inhabited the San Joaquin Valley, ranging from Stanislaus County in the north to the Tehachapi Mountains of Kern County in the south (Montanucci 1970). The foothills of the Sierra Nevada and Coast Range Mountains defined the eastern and western boundaries. The currently known occupied range of the BNLL is scattered in undeveloped lands of the San Joaquin

Valley and Coast Range foothills. The Ciervo, Tumey, and Panoche Hills and the Panoche Valley all support populations of BNLL in the northern portions of its range. The BNLL prefers to inhabit open, sparsely vegetated areas of low relief. Nonnative grasslands and valley sink-scrub communities support BNLL populations on the San Joaquin Valley floor. Valley needlegrass grasslands and alkali playas also provide suitable habitat for BNLL. The most important aspect of any BNLL habitat is sparse vegetation. BNLL rely mainly on speed to avoid predators and catch prey. A thick cover of herbaceous vegetation impedes BNLL movement, making them more vulnerable to predators and less likely to capture prey. In areas with thick herbaceous vegetation, BNLL will utilize barren washes and roads (Warrick et al. 1998).

Adult BNLL emerge from below ground dormancy in early to mid-April and remain active into July and August (Germano and Williams 2005; CDFW 2004). Adults are rarely seen in September. Hatchlings emerge in July and remain active into late October and early November (Germano and Williams 2005; CDFW 2004). Optimal air temperatures for BNLL range between 23.5°C and 40°C and optimal ground temperatures are between 22°C and 36°C. Home range areas differ between males and females. Warrick et al. (1998) found the average home range of males to be 4.24 hectares and females to be 2.02 hectares. Males will aggressively defend their home ranges against other males. Germano and Williams (2005) noted many instances of males with scars the outline the jaws of other adult BNLL. Other studies had Passive Integrated Transponders (PIT) tags broken in fighting males (Germano and Williams 1993).

Other lizards that may overlap with the BNLL include the side-blotched lizard (*Uta stansburiana*), western whiptail (*Aspidoscelis tigris*), and coast horned lizard (*Phrynosoma coronatum*; Stebbins 2003). The BNLL is the largest of these lizards and will consume smaller lizards when given the opportunity. Germano and Williams (2005) noted adult BNLL eating side-blotched lizards and smaller BNLL. While adult BNLL do not hesitate to prey on smaller lizards, grasshoppers, crickets, and beetles make up the majority of their diet (Germano et al. 2007). Diet preferences can vary by location and year. Coleopterans made up the bulk of BNLL diet on the Elkhorn Plain and Lokern Natural Area. Grasshoppers were the main prey source on the Kern Front Oil Field (Germano 2007). Bees, wasps, and ants will also be taken by BNLL, although in smaller numbers than grasshoppers and beetles.

Adult BNLL emerge from dormancy in early April and breeding activity begins within a month of emergence. Breeding activities last from April through the beginning of June and may last

throughout June. Eggs are laid in June and July, with clutch size ranging from two to six eggs (Montanucci 1967) and hatchlings emerge after approximately two months of incubation. Germano and Williams (2005) first noted hatchlings appearing on the Elkhorn Plain in mid-July, depending on the weather trends of that year. Cool wet weather patterns in April may delay the emergence of adults, thus delaying egg laying and hatchling emergence.

Potential predators for the BNLL include whipsnakes, gopher snakes, western rattlesnake, loggerhead shrike, American kestrel, prairie falcon, burrowing owl, various diurnal raptors, SJKF, coyote, American badger, and adult BNLL. Germano and Williams (2005) found several individuals that had been struck by passing vehicles.

San Joaquin Kit Fox (Vulpes macrotis mutica) (SJKF)

Status and Description:

Legal status – The SJKF is currently listed as endangered by the ESA and threatened by the CESA (Fish and Game Code §§ 2050 et seq.). The SJKF was originally listed as being in danger of extinction under the Endangered Species Preservation Act of 1966 (32 FR 4001, March 11, 1967), and is currently listed as endangered under the ESA of 1973, as amended. No critical habitat has been designated for the SJKF.

The SJKF is included in the *Recovery Plan for Upland Species of the San Joaquin Valley, California* (USFWS 1998).

Species ecology – The SJKF was originally described to science by C. Hart Merriam (1888) from near Riverside, California. This area is now highly urbanized and no longer supports kit fox. Historically, eight subspecies of kit fox have been recognized, but now only two are recognized: kit fox (*Vulpes macrotis macrotis*) and SJKF (*Vulpes macrotis mutica*; Mercure et al. 1993). The kit fox is the smallest canid species in North America, and the SJKF is the larger of the two subspecies. SJKF have long, slender legs and are approximately 30 cm tall at the shoulder. The average male weighs 2.3 kilograms and the average female weighs 2.1 kilograms (Morrell 1972). SJKF have a relatively small, slim body, large ears set close together, and a long, bushy tail tapering toward the tip. The tail is usually carried low and straight. The most common colorations are described as buff, tan, or yellowish-gray on the body. Two distinctive coats develop each year: a tan summer coat, and a silver-gray winter coat. The undersides vary from white to light buff. The

tail is distinctly black tipped.

Other species of fox that occur in the Panoche Valley region include the red fox (*Vulpes vulpes*) and gray fox (*Urocyon cinereoargenteus*). Because all three fox species inhabit the same region, are often fast moving, and nocturnal, identification of SJKF can be a challenge. The coat color and black tipped tail can usually distinguish the SJKF from the red fox. Gray foxes also have a black tipped tail, but also have a distinct black line running along the top to the tail, which is lacking in the SJKF. The small body size of the SJKF can also aid in identification.

Historically, SJKF was known to occur in most of the San Joaquin Valley from southern Kern County north to San Joaquin County (Grinnell et al. 1937); however these authors believe that the SJKF had already had its range substantially reduced by the 1930s. Currently, the largest extant populations of SJKF are in western Kern County on and around the Elk Hills and Buena Vista Valley, and the Carrizo Plains Natural Area in San Luis Obispo County (USFWS 1998). The USFWS (1998) identified three core areas for SJKF populations: Carrizo Plain, western Kern County, and the Ciervo-Panoche Natural Area. The Ciervo- Panoche Natural Area consists of the Ciervo Hills, Tumey Hills, Panoche Hills, and the Panoche Valley. Cypher et al. (2007) identified the Panoche Valley and the Pleasant Valley populations as potential source populations for recolonizing reclaimed farmland in the San Luis Unit of the Central Valley Project. This study showed reasonable connectivity between Panoche Valley and Pleasant Valley along the western edge of the San Luis Unit, as well as reasonable connectivity between Panoche Valley, Pleasant Valley, and reclaimed farmland to the east. Survey efforts to determine SJKF population size are currently underway at Ciervo Panoche Natural Area in Fresno and San Benito Counties, Fort Hunter Liggett in Monterey County, and Camp Roberts in Monterey and San Luis Obispo Counties. Recent records from the 1980s and 1990s also exist for San Luis Reservoir in Merced County (Briden et al. 1987), North Grasslands and Kesterson National Wildlife Refuge on the valley floor in Merced County (Paveglio and Clifton 1988), and in the Los Vaqueros watershed in Contra Costa County. Optimal habitat for SJKF is arid with relatively low grassland vegetation. Preferred habitat is often dependent on the density of kangaroo rats and lagomorphs, the two favored prey items of SJKF.

SJKF are predominantly nocturnal, with peaks in activity occurring during crepuscular periods and are occasionally seen during the day during late spring and early summer (Meaney et al. 2006; Orloff et al. 1986). Distance of nightly movements varies depending on the season. Nightly movements on the Elk Hills Naval Petroleum Reserves averaged 15.4 km during the breeding season, and 10.2 km during the pup-rearing season (USFWS 1998). Home ranges have been reported from as small as 2.6 km2 to as large as 31 km2 (USFWS 1998). Home ranges may overlap, depending on prey density and prey allocation. Zoellick et al. (2002) found that home range size and home range overlap of SJKF did not differ between undisturbed areas and areas disturbed by the Naval Petroleum Reserves. Zoellick et al. (2002) showed up to a 30 percent home range overlap in SJKF, and surmised that this was due to a localized food source such as a high density or rabbits.

The diet of the SJKF varies seasonally and annually, based on variation in abundance of potential prey. In descending order of occurrence, white-footed mice, California ground squirrels, kangaroo rats, SJAS, black-tailed jack rabbits, and chukar partridge were identified in SJKF scat (USFWS 1998; Archon 1992). Other studies have shown that kangaroo rat and lagomorphs are important staples in the diet of SJKF (Meaney et al. 2006). Laughrin (1970) collected over 600 scat samples of SJKF, and 80 to 90 percent of this contained kangaroo rat remains (Laughrin 1970 in Meaney et al. 2006). Cypher et al. (2000) noted that SJKF abundance in the southern San Joaquin Valley was highly correlated with precipitation based prey abundance, particularly kangaroo rat. Drought years, which decreased kangaroo rat abundance, produced significant negative and rapid changes in SJKF abundance. SJKF is also an opportunist and will not pass up potential scavenging opportunities. Scat samples have also included human foods, paper, cloth, and larger mammals such as cattle and sheep that had been scavenged.

SJKF occupy several dens throughout their home range during the year. Dens are usually modified ground squirrel, badger, or coyote dens, and can be up to 2.3 m deep (Tannerfeldt et al. 2003). Radio telemetry studies indicate that foxes use individual dens for an average of 3.5 days before moving to a different den. Possible reasons for frequently changing dens include parasite load, prey depletion, and predator avoidance (Egoscue 1956; USFWS 1998); however an adult SJKF can easily cover its entire home range in one night (Cypher et al. 2005). Multiple dens in the home range of an individual SJKF are necessary for thermal regulation, resting, and predator avoidance. Den openings are 20 to 25 cm high and less than 20 cm wide to exclude coyotes and badgers

(Meaney 2006). Resting dens usually are simple with only one opening, while natal dens can be much deeper and more complex, and have multiple openings. Artificial dens constructed by humans can act as suitable dens for SJKF. Artificial dens are generally lengths of buried pipe or culvert approximately 20 cm in diameter (Cypher et al. 2007).

Females are capable of reproducing at ten months old and begin searching for natal dens in September and October (USFWS 1998). Pair bonds between male and female SJKF vary; some will mate for life while others may only remain together for a single breeding season. SJKF litters can range from one to six pups and success is often dependent on prey abundance (White and Ralls 1993). SJKF litter size averaged 3.8 for adults more than one year old and 2.5 for yearlings (Cypher et al. 2000). Natal dens have more than one opening and are changed two to three times per month. Females rarely hunt while lactating and the male supplies the female with prey during the first few weeks of pup-rearing (Meaney 2006). Family groups generally split up in October, although pups may remain with the parents and assist with rearing the next generation.

Dispersal of yearling SJKF averaged eight kilometers during a six year study on the Naval Petroleum Reserves (Scrivner et al. 1987). Long distance dispersals of up to 69 km by SJKF throughout their range have also been noted (Meaney 2006). While agricultural lands may not present suitable habitat for SJKF, they have been known to disperse through them. Agricultural lands, highways, aqueducts, and urban areas have all been used by dispersing SJKF (USFWS 1998). While these man-made obstacles do not seem to inhibit SJKF dispersal and nightly movements (Zoellick et al. 2002, Cypher et al. 2005), fences and walls can create impenetrable barriers to SJKF movement (Cypher and Van Horn Job 2009). Simple fence alterations such as portals, larger mesh or hog wire, and elevating the bottom six inches off the ground can negate the negative effects of fences and walls and make them permeable to SJKF (Cypher and Von Horn Job 2009).

Predators of the SJKF include golden eagle, domestic dogs, coyotes, red fox, and badgers. Cypher et al. (2005) radio collared 63 SJKF. Twenty-five of those were recovered dead, and of those 25, 12 (48 percent) were killed by large predators, most likely coyotes. Fences which are not permeable to SJKF as described above, can cause a serious threat to SJKF being chased by potential predators. However, a permeable fence may aid in SJKF escape if the fence is situated to provide through points at reasonable intervals and limits the ability of predators to pass through (Cypher and Van Horn Job 2009).

California Tiger Salamander (Ambystoma californiense) (CTS)

Status and Description

Legal status – The CTS population segment that may occur within the Conservation Lands is currently listed as threatened by the ESA and threatened by the CESA (Fish and Game Code §§ 2050 et seq.). Two other distinct population segments in Sonoma County and Santa Barbara County are listed as endangered by the ESA. The Santa Barbara County Distinct Population Segment was listed as endangered in 2000. The Sonoma County Distinct Population Segment was listed as endangered in 2002. The remaining population occurs throughout central California, including the study area. The Central California Distinct Population Segment was listed as threatened in 2004. No Recovery Plan has been written for the CTS to date.

Species ecology – The CTS was formerly classified as a subspecies of tiger salamander (*Ambystoma tigrinum*) but has since been identified as an individual species (Kraus 1988; Shaffer et al. 1991). A broad head, small eyes, and tubercles on the side of the feet characterize CTS. Coloration is a black back with yellow, cream, or white oval spots or bars. Some individuals may have a prominent cream band on the undersides. Snout-vent length ranges from 7.6 to 12.7 cm, and total length ranges from 15 to 22 cm (Stebbins 1966 and 2003).

The CTS originally inhabited most of central California, and remains in remnant populations throughout much of its original range. CNDDB records for CTS show its distribution encompasses portions on Alameda, Amador, Calaveras, Contra Costa, Fresno, Kern, Kings, Madera, Mariposa, Merced, Monterey, Sacramento, San Benito, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Solano, Sonoma, Stanislaus, Tulare, Tuolumne, and Yolo Counties (NatureServe 2009). About 80 percent of all extant occurrences are in Alameda, Contra Costa, Madera, Merced, Monterey, San Benito, ad Santa Clara counties, with 30 percent of all occurrences in Alameda County (*ibid*.). The use of vernal pools and other temporary bodies of water for breeding limits the CTS to areas of low elevation and low topographic relief throughout their range (Stokes et al. 2008). Ephemeral vernal pools which refill with water on a yearly basis, are 40 to 80 cm in depth, and have a surface area of 0.2 hectares or more are optimal for breeding CTS, although small, shallower pools will also house breeding CTS (Stokes et al.

2008). Depth of the breeding pool was highly correlated with breeding CTS. Stokes et al. (2008) found no CTS larvae in pools with an average depth of less than 22 cm. Deep pools with

permanent water may not be optimal for breeding populations of CTS because they often house predatory fish, crayfish, or bullfrogs that prey upon larval CTS. This creates a narrow window of pool depth where the pool will not completely dry out before CTS have metamorphosed, but also not contain water year round and house predators. Metamorphosed CTS move out of the vernal pools and into upland habitats. Small mammal burrows are important features of upland habitat. Adult CTS occupy small mammal burrows in grassland, savanna, or open woodland habitats (Trenham and Shaffer 2005).

Activity patterns of adult CTS are not well understood. Adult CTS live their entire lives in the burrows of small mammals such as the California ground squirrel. Adults begin moving toward breeding pools when the first fall rains begin to inundate pools. Breeding adults will continue moving to pools through the winter and spring. Adults can generally be found at breeding pools from October through May, although breeding is highly dependent on the amount of precipitation (Trenham et al. 2001; Trenham and Shaffer 2005). Adult CTS leave the breeding pools in late spring and return to upland habitats. Trenham and Shaffer (2005) used pitfall traps at various intervals away from a pool to determine the extent of upland use. They found that the numbers of adult CTS declined as distance from the pool increased out to 620 meters. Subadults also moved up to 600 meters away from the pools, but most were concentrated between 200 and 600 meters from the pool. This has led managers to suggest preserving upland habitats with suitable small mammal burrows out to 600 meters from breeding pools (Trenham and Shaffer 2005).

CTS may take upward of four to five years to reach sexual maturity (Trenham et al. 2000). Although individuals can live upward of ten years, less than 50 percent of individuals breed more than once (Trenham et al. 2000). Rainfall can significantly alter adult breeding pool attendance, and production of metamorphs tends to be a boom-or-bust scenario (Loredo and Van Vuren 1996). Typically, greater numbers of breeding adults return to pools during years with greater rainfall (Trenham et al. 2000 and 2001; Cook et al. 2006; Stokes et al. 2008). Males are often the first to arrive at breeding pools and remain in the pool longer than females (Trenham et al. 2000). Larvae remain in the pools approximately four months and emigrate from the pools as they dry. Metamorph emigration typically occurs throughout May and is directly related to the pool drying date (Trenham et al. 2000).

Often amphibian populations are used as an example for the metapopulation/source-sink models. The CTS populations at different breeding pools often act in a metapopulation fashion (Trenham et

al. 2001). Mark – recapture studies found that while most breeding adults return to their natal pool, 22 percent dispersed to different ponds (Trenham et al. 2001). It should be noted that Trenham and Shaffer (2005) did not capture any CTS, adult or subadult, more than 620 meters from the pool. Thus, pools more than 1,240 meters from one another may limit dispersal. Breeding CTS have been known to use artificially created pools, and the creation of pools in a stepping-stone fashion has been suggested to aid dispersal between populations (Stokes et al. 2008).

The diet of larval and metamorphosed CTS is not well studied. Studies on the diet of other larval *Ambystomids* have found that less developed larvae prey mainly on zooplankton, and larger, more developed larvae prey on amphipods, mollusks, and insect larvae as well as zooplankton (Dodson and Dodson 1971; Hoff et al. 1985; McWilliams and Bachmann 1989). Adult diet consists of terrestrial invertebrates such as earthworms, snails, and other insects. Vertebrates, such as small mammals and fish, may be taken as well (Stebbins 1959; NatureServe 2009).

Predatory fish and amphibian populations negatively affect CTS populations. Mosquitofish (*Gambusia* sp.), smallmouth bass (*Micropterus dolomieu*), green sunfish (*Lepomus cyanellus*), and bullfrogs (*Rana catesbiana*) are common predators of CTS larvae and adults (NatureServe 2009). Yearly drying of vernal pools used for breeding greatly reduces the numbers of these potential predators, however heavy spring and winter rains can connect pools to other permanent water sources and introduce CTS predators.

San Joaquin Antelope Squirrel (Ammospermophilus nelsoni) (SJAS)

Status and Description

Legal status - The SJAS is listed as threatened under CESA (October 2, 1980). The species does not have its own recovery plan, but is included in the *Recovery Plan of Upland Species of San Joaquin Valley, CA* (USFWS 1998).

Species ecology – The SJAS is one of five subspecies in the genus *Ammospermophilus*. This genus is generally confined to desert and arid steppe habitats and open shrubland communities in the southwest United States and portions of Mexico. Merriam (1893) collected the type specimen for this species in Tipton, Tulare County, California.

Adults weigh between 130 and 170 grams. They have a fusiform shape typical of ground dwelling

squirrels. They are buffy tan, have a light stripe on their sides, and have lighter fur on the ventor. They are much smaller than the California ground squirrel (*Otospermophilus beecheyi*), and have a shorter, less bushy, flatter tail.

Grinnell and Dixon (1918) observed an uneven distribution, and they noted that the species occurred in abundance in a few spots that included the Lokern and Elk Hills.

According to Williams (1980), as of 1979, there was 680,000 acres of habitat of which only 102,000 acres was of good quality; none of the best habitat originally described by Grinnell and Dixon remained. Good quality is defined as habitat that supports one to four individuals per acre. The SJAS has been nearly eliminated from the Tulare Basin floor and continues to exist in more marginal areas such as the mountainous areas bordering the western edge. In 1979, there was a notable decline and disappearance from a number of formerly occupied patches including Pixley, Alkali Sink and Kerman Ecological Reserves, and Allensworth State Park (although SJAS were never abundant here; Wes Rhodenhamel, pers. comm.).

SJAS are found in arid annual grassland and shrublands and are numerous in areas with sparse to moderate cover of shrubs including saltbush, ephedra (*Ephedra* sp.), bladderpod (*Isomeris arborea*), golden bushes (*Isocoma* sp.), matchweed and others. SJAS are present but tend to sparsely inhabit shrubless areas. SJAS use shrubs and burrows to escape predators and escape the heat of the sun. For this reason, they may be somewhat dependent on kangaroo rats whose burrows they may enlarge and takeover. The range of the GKR overlaps extensively with the SJAS, but microhabitats may differ. SJAS are also associated with friable soils.

SJAS breed in late winter and early spring. Young do not breed in the first year. Gestation is 26 days, and there are six to 11 embryos. Young are born in March and April and emerge from the burrow after 30 days. The young are weaned as early as late April to late May. Mortality on the Elkhorn Plain Ecological Reserve was 0.7 for young and 0.5 to 0.6 for adults.

These squirrels are generally omnivorous eating green vegetation, fungi, insects (primarily grasshoppers), and seeds (including filaree, brome, ephedra, and saltbush). SJAS are diurnal.

LITERATURE CITED

Archon, M. 1992. Ecology of the San Joaquin kit Fox in Western Merced County, California. M.A. Thesis, California State University, Fresno. 45 pp.

Briden, L.E., M. Archon, and D.L. Chesemore. 1987. Ecology of the San Joaquin Kit Fox (Vulpes macrotis mutica) in Western Merced County, California. In Proceedings of the San Joaquin Valley Endangered Species Conference. 81-87 pp.

California Department of Fish and Game. 2004. Approved Survey Methodology for the Blunt-nosed Leopard Lizard.

Cook, D.G., P.C. Trenham, and P.T. Northen. 2006. Demography and Breeding Phenology of the California Tiger Salamander (Ambystoma californiense) in an Urban Landscape. Northwestern Naturalist 87:215-224.

Cypher, B.L., C.D. Bjurlin, and J.L. Nelson. 2005. Effects of Two-lane Roads on Endangered San Joaquin Kit Foxes. California State University-Stanislaus, Endangered Species Recovery Program, Fresno, California.

Cypher, B. L., S. E. Phillips, and P. A. Kelly. 2007. Habitat Suitability and Potential Corridors for San Joaquin Kit Fox in the San Luis Unit Fresno, Kings and Merced Counties, California. California State University-Stanislaus, Endangered Species Recovery Program, Fresno, California.

Cypher, B. L., Van Horn Job, C. L. 2009. Permeable Fence and Wall Designs that Facilitate Passage by Endangered San Joaquin Kit Foxes. California State University-Stanislaus, Endangered Species Recovery Program, Fresno, California.

Cypher, B. L., G. D. Warrick, M. R. M. Otten, T. P. O'Farrell, W. H. Berry, D. E. Harris, T. T. Kato, P. M. McCue, J. H. Scrivner, and B. W. Zoellick. 2000. Population Dynamics of San Joaquin Kit Foxes at the Naval Petroleum Reserves in California. Wildlife Monographs 145: 1-43.

Dodson, S.I. and V.E. Dodson. 1971. The Diet of Ambystoma tigrinum Larvae from Western Colorado. Copeia 1971:614–624.

Egoscue, H. J. 1956. Preliminary studies of the kit fox in Utah. Journal of Mammalogy. 37: 351-357. Germano, D. J. 2007. Food Habits of the Blunt-Nosed Leopard Lizard. The Southwestern Naturalist 52(2).

Germano, D. J. and D. F. Williams. 1993. Recovery of the Blunt-nosed Leopard Lizard: Past Efforts, Present Knowledge, and Future Opportunities. Transactions of the Western Section. The Wildlife Society 28:38-47.

Germano, D. J., and D. F. Williams. 2005. Population Ecology of Blunt-nosed Leopard Lizards in High Elevation Foothill Habitat. Journal of Herpetology 39:1-18.

Grinnell, J. and J. S. Dixon. 1918. Natural History of the Ground Squirrels of California. Contribution from the University of California Museum of Vertebrate Zoology. Monthly Bulletin of the State Commission of Horticulture. 7:597-708.

Grinnell, J., J. S. Dixon, and J. M. Linsdale. 1937. Fur-bearing Mammals of California. Vol. 2. University of California Press, Berkeley.

Hoff, K.S., M.L. Lannoo, and R.J. Wasserburg. 1985. Kinematics of midwater prey capture by Ambystoma (Caudata: Ambystomatidae) larvae. Copeia. 1:247-251.

Kraus, F. 1988. An Empirical Evaluation of the Use of the Ontogeny Polarization Criterion in Phylogenetic Inference. Systematic Zoology 37:106-141.

Laughrin, L. 1970. San Joaquin Kit Fox: Its Distribution and Abundance. California Department of Fish and Game, Sacramento, Wildlife Management Branch, Admin. Rep. No. 70-2, 20 pp.

Loredo, I., and D. Van Vuren. 1996. Reproductive Ecology of a Population of the California Tiger Salamander. Copeia 1996:895-901.

McWilliams, S.R. and M.D. Bachmann. 1989. Foraging Ecology and Prey Preference of Pond-form Larval Small-mouthed Salamanders, Ambystoma texanum. Copeia 1989:948–961.

Meaney, C. A., M. Reed-Eckert, and G. P. Beauvais. 2006. Kit Fox (Vulpes macrotis): A Technical Conservation Assessment. Golden, CO: USDA Forest Service, Rocky Mountain Region.

Mercure, A. K., K. Ralls, K. P. Koepfli, and R. B. Wayne. 1993. Genetic Subdivision Among Small Canids; Mitochondrial DNA Differentiation of Swift, Kit and arctic Foxes. Evolution 47:1313-1328.

Merriam, C. H. 1888. Description of a New Fox from Southern California. Proceedings of the Biological Society, Washington. 4:135-138.

____ 1893. Description of Eight New Ground Squirrels of the Genera Spermophilus and Tamias from California, Texas, and Mexico. Proceedings of the Biological Society, Washington. 8:129-138. Montanucci, R. R. 1967. Further Studies on Leopard Lizards, Crotaphytus wislizenii silus. Stejneger. Herpetologica 21:270-283.

_____ 1970. Analysis of the Hybridization Between Crotophytus wislizenii and Crotaphytus silus (Suaria: Iguanidae) in California. Copeia 1970:104-123.

Morrell, S. H. 1972. Life History of the San Joaquin Kit Fox. California Department of Fish and Game. 58:162-174.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application] Version 7.1.

NatureServe, Arlington, Virginia. http://www.natureserve.org/explorer. Accessed June 2009.
Paveglio, F. L., & S. D. Clifton. 1988. Selenium accumulation by San Joaquin Kit Foxes and Coyotes in the Kesterson National Wildlife Refuge Area: Draft (unpublished report). Los Banos, CA. U.S. Fish and Wildlife Service.

Scrivner, J. H., T. P. O'Farrell, and T. T. Kato. 1987. Dispersal of San Joaquin Kit Foxes, Vulpes macrotis mutica, on Naval Petroleum Reserve #1, Kern County, California. Rep. No. EGG 10282-2190. EG&G Energy Measurements, Goleta, CA. 32 pp.

Shaffer, H.B., J.M. Clark, and F. Kraus. 1991. When Molecules and Morphology Clash: A Phylogenetic Analysis of the North American Ambystomatid Salamanders (Caudata: Ambystomatidae). Systematic Zoology 40:284-303.

Stebbins, R. C. 1966. A Field Guide to Western Reptiles and Amphibians. Houghton Mifflin, Boston.

_____ 1959. Reptiles and Amphibians of the San Francisco Bay Region. University of California Press, Berkeley, California.

____ 2003. A Field Guide to Western Reptiles and Amphibians, Third Edition Houghton Mifflin Company New York, NY ISBN: 0-395-98272-3.

Stokes, D. D.G. Cook, and P.C. Trenham. 2008. Sonoma California Tiger Salamander Population Ecology and Preserve Management: An Eight Year Study. Prepared for U. S. Fish and Wildlife Service, 2800

Cottage Way, W-2605, Sacramento, California 95825-1846, FWS Agreement No. 814206J158. 40 pp. + appendices.

Tannerfeldt, M., A. Moehrenschlager, and A. Angerbjorn. 2003. Den Ecology of Swift, Kit and Arctic Foxes: A Review. Pages 167–181 in M.A. Sovada and L. Carbyn, Editors. The Swift Fox: Ecology and Conservation of Swift Foxes in a Changing World. Canadian Plains Research Center, University of Regina, Regina, Saskatchewan, Canada.

Trenham, P.C., W.D. Koenig, and H.B. Shaffer. 2001. Spatially Autocorrelated Demography and Interpond Dispersal in the California Tiger Salamander, Ambystoma californiense. Ecology. 82: 3519-3530. Trenham, P.C. and H.B. Shaffer. 2005. Amphibian Upland Habitat Use and Its Consequences for Population Viability. Ecological Applications. 15:158-1168.

Trenham, P.C., H.B. Shaffer, W.D. Koenig, and M.R. Stromberg. 2000. Life History and Demographic Variation in the California Tiger Salamander (Ambystoma californiense). Copeia. 2000:365-377.

U. S. Fish and Wildlife Service. 1998. Recovery Plan for Upland Species of the San Joaquin Valley, California. Region 1, Portland, OR.

Warrick, G. D., T. T. Kato, and B. R. Rose. 1998. Microhabitat Use and Home Range Characteristics of Blunt-nosed Leopard Lizards. Journal of Herpetology 32:183–191.

Williams, D. F. 1980. Distribution and Population Status of the San Joaquin Antelope Squirrel and Giant Kangaroo Rat. California Department of Fish and Game, Sacramento, Nongame Wildlife Investigation, Final Rep. E-W-R, IV-10.0 48 pp.

White, P.J., and K. Ralls. 1993. Reproduction and Spacing Patterns of Kit Foxes Relative to

Changing Prey Availability. Journal of Wildlife Management. 57:861-867.

Zoellick, B. W., C. E. Harris, B. T. Kelly, T. P. O'Farrell, T. T. Kato, and M. E. Koopman. 2002. Movements and Home Ranges of San Joaquin Kit Foxes (Vulpes macrotis mutica) Relative to Oil-field Development. Western North American Naturalist. 62, 151-159.

Appendix D – Covered Species Survey Results Summary

Appendix D
Covered Species Survey Results Summary

Covered Species are those species which this CMP is designed to conserve and protect in perpetuity. These species are considered extant on all Conservation Lands; several studies have been completed to identify the suitable habitat for each species for each of the conservation areas (Table 1). These areas will be the focus for management and monitoring for specific Covered Species while preserving the entirety of the Conservation Lands for all Covered Species (see Appendix A for Species Descriptions). Habitat suitability for three of the Covered Species, BNLL, GKR, and SJKF, was determined by several decision rules which varied slightly for each species based on literature review, occupancy sampling, habitat suitability modeling, and survey results. The location of the CTS mitigation lands was based on 1.2 mile buffers around pond habitat. For the remaining Covered Species, SJAS, and CACO, habitat and open space were the primary criteria as supporting on-going long term conservation efforts for these species.

Table 1. Covered Species and Conservation Acreage on VFCL, VRCL, and SCRCL

Species	Federal	State	Conservation Acreage
Blunt-nosed Leopard Lizard	Endangered	Endangered, Fully Protected	11,883
San Joaquin Kit Fox	Endangered	Threatened	14,863
Giant Kangaroo Rat	Endangered	Endangered	16,576
San Joaquin Antelope Squirrel	None	Threatened	24,185[1]
California Tiger Salamander	Threatened	Threatened	3,694[2]
California Condor	Endangered	Endangered, Fully Protected	24,185[3]

[1]For purposes of this table, San Joaquin antelope squirrel suitable conservation acreage is assumed to include all of the Conservation Lands because this species is not slope-limited.

[2]Suitable aestivation habitat on VFCL and VRCL

[3]Entire Conservation Lands acreage is suitable foraging habitat for this species.

Blunt Nosed Leopard Lizard (BNLL)

No BNLL were found within the Project Footprint during the 2013 adult season surveys (May 9 to July 13, 2013). There were a total of 27 observations of BNLL in the VFCL (Figure 1) with the majority of the observations associated with the wash habitat along Panoche Creek. Also included on Figure 1 are the 105 observations of BNLL from previous surveys in 2009 and 2010 (LOA 2010). None of the previous observations are located in the Project Footprint, but are fully located within the VFCL.

The 2013 hatchling and sub-adult season surveys were completed between May 9 and July 13, 2013. There were a total of 13 observations of BNLL made during the surveys (Figure 1). A majority of the observations made during the hatchling and sub-adult season surveys were associated with the wash habitat along Panoche Creek in the VFCL. However, there was one observation of a BNLL hatchling made outside the Valley Floor Conservation Lands. This BNLL hatchling observation was found just north of the Valley Floor Conservation Lands boundary that encompasses Las Aguilas Creek. The Project site boundaries were modified to avoid this observation and the area within the avoidance zone was added to the VFCL. SCRCL were surveyed in September of 2012. Three teams of three biologists surveyed drainages, with one biologist walking within the drainage and two biologists walking on either side of the drainage. It is important to note that during BNLL focused surveys, juvenile BNLL were observed within drainages and on hill slopes. In addition, BNLL were incidentally observed during GKR focused surveys from September 11th through September 21st, 2012. The majority of these observations were not associated with drainages. Thirty-one BNLL were observed during focused surveys for BNLL and 30 were incidental detections during GKR focused surveys. A total of 61 BNLL detections occurred in a two-week period. All BNLL observed were juveniles except for two subadults (Figure 2).

Suitable soil type and vegetation combinations exist on the Valadeao Ranch Conservation Lands to support BNLL populations; although to date, no BNLL have been observed on the VRCLs. This may be more a factor of sub-optimal survey conditions (cool and wet) than an absence of BNLL. In addition, suitable habitat is contiguous within the western and southeastern edges of the Project site. Additional potential habitat occurs throughout the length of Little Panoche Valley (northern portion of the Valadeao Ranch Conservation Lands).

Consultation with USFWS and CDFW determined that the amount of potentially suitable habitat appropriate for mitigation falls within a larger region, which includes undeveloped areas with slopes between 0 and 11 percent that are roughly contiguous with the Panoche Valley floor and contain well drained soils and non-native grasslands, which includes parts of the VRCL, the VFCL, and a large portion of SCRCL. The Applicant has secured roughly 1,485 acres on the VRCL, 2,523 acres of suitable VFCL (including 389 acres of onsite floodplain), and 7,875 acres on SCRCL that have these characteristics, totaling 11,883 acres of suitable habitat Conservation Lands.

Giant Kangaroo Rat

The GKR source populations on the SCRCLs were surveyed in September of 2012. The source populations were originally mapped by Williams et al. (1995). One hundred 50-meter (m) radius plots were surveyed for GKR and active precincts on the Silver Creek Ranch. GKR presence was verified by the presence of presumed scat (larger than 7 millimeters (mm)) and

footprints (larger than 47mm), and further verified by the presence of surface pit caches as well as suitable burrows. Active precincts were identified by the presence of scat, footprints, tail drags and surface pit caches. Ninety-nine of the 100 plots surveyed supported GKR. Average density for these plots was 25.66 GKR precincts per plot, with an average of 13.23 per acre. As population densities of GKR on the Silver Creek Ranch within the source population polygons are high and the suitable habitat of Silver Creek Ranch outside of these polygons is moderate, the average density for GKR plots on the Silver Creek Ranch was used for the source population areas. That density estimate was reduced (proportionally to reductions on the Project site and Valley Floor Conservation Lands form high to moderate) to an estimate of 2.63 GKR per acre for the suitable habitat outside of the source populations. These density estimates were used to estimate a population of up to 44,871 individual GKR (Table 2).

Table 2 Estimated Number of GKR On Valadeao Ranch and Silver Creek Ranch Conservation Lands*

Mitigation Site	Average Density Of GKR (GKR/ACRE)	GKR Habitat (Acres)	Estimated Number of Individuals	Source for Density Estimates
Total Valadeao Ranch CL	0.31	6,830	2,137	Average density of GKR precincts for transects in moderately suitable habitat on the Project site and Valley Floor CL
Silver Creek Ranch CL† (High Suitability)	13.23	2,441	32,294	Average density of GKR precincts for 100 50-meter plots focused in source population polygons identified in the Recovery Plan (USFWS 1998) on the Silver Creek
Silver Creek Ranch CL† (Moderate Suitability)	2.63	4,782.3	12,577	Average density of GKR precincts for 100 50-meter plots focused in source population polygons identified in the Recovery Plan (USFWS 1998) on the Silver Creek Ranch CL reduced proportional to reductions in estimates on the Project
Silver Creek Ranch CL (Total)		**7,223.3**	**44,871**	**The total of the two rows above.**

*Based on empirical data collected in 2009, 2010 and Historical Data. 1992-1995 (Williams et al. 1995), 2009 and 2010 appeared to be relatively good for GKR. Population densities can be 6.6 times lower in poor years.
†Based on empirical data collected in 2012 on Silver Creek Ranch Conservation Lands within source population polygons previously defined and previously identified in Figure 41 of the Recovery Plan (USFWS 1998).

In addition, a 100 percent coverage survey of the Project Footprint for GKR was conducted and a

systematic stratified sampling effort was completed on the Conservation Lands in February and March

2013. Follow-up surveys on the Action footprint were conducted from July 13 to July 15, 2013, to verify or update the status of inactive sites. The survey methodology that was implemented was approved by CDFW and was provided to USFWS prior to start of the survey.

Field surveys used a grid sampling system whereby 30m x 30m grid squares were evaluated for the presence of GKR sign. Grid squares were arranged along north-south running parallel transects. Surveyors visually inspected each grid square for evidence of GKR precincts. Burrow precincts were considered occupied based on presence of scat, tracks, tail-drags, pit caches, fresh excavations, and cropped vegetation around a series of suitably sized horizontal and vertical burrow openings.

Precincts that did not appear to be occupied were also identified and mapped as inactive. Precincts were considered unoccupied when characteristic horizontal and vertical burrow openings and the surrounding area were devoid of all sign (fresh scat, tracks, fresh digging, and cropped vegetation). Evidence of other congeneric species was also noted and recorded as "other kangaroo rat."

Within the Project Footprint and Valley Floor Conservation Land, the surveyed grid accounted for 100 percent coverage plus a 500-foot buffer (in areas where landowner access was granted). The Silver Creek Ranch Conservation Lands and Valadeao Ranch Conservation Lands were surveyed using the same methodology described above but with wider transects. No buffers were surveyed for the Conservation Lands since surveyors did not have landowner access outside these areas. Transects were systematically distributed across the Project Footprint and included areas previously identified as high and low suitability habitats in past studies. The Silver Creek Ranch Conservation Lands and Valadeao Ranch Conservation Lands surveys were designed to cover approximately 20-30 percent of the Conservation Lands, therefore, transect spacing was approximately 148 meters.

A total of 48,446 survey grid cells were evaluated for GKR presence; 9,430 grid cells were not evaluated due to lack of landowner access, terrain that was too steep to be safely accessed,

presence of bulls or other reasons precluding surveyors from entering the grid cell, or data equipment error. These areas are combined within the cells that are highlighted as "No Data."

Of the 16,775 total survey grid cells located within the Project Footprint and the 500-foot buffer study area, approximately 13,825 survey grid cells were able to be evaluated (11,858 within the Project Footprint boundaries and 1,967 within the 500-foot buffer). A total of 296 of these grid cells were observed to be active at the time of the survey (1.8 percent of evaluated cells). A total of 197 cells within the Project Footprint are considered active (1.7 percent of evaluated cells in the Project Footprint), while 99 cells within the 500-foot buffer were considered to be active (0.5 percent of evaluated cells in 500 foot buffer). The remaining 2,950 grid cells were not evaluated primarily due to lack of landowner access. These areas are combined within the cells that are noted as "No Data." Table 3 describes the results of the GKR survey and Figure 3 depicts the results of the GKR survey in the Project Footprint.

Table 3 GKR survey results within the Project Footprint

	GKR Grid Cell Status					
	Active	**Inactive**	**No GKR**	**Relict GKR**	**No Data**	**Total**
Project Footprint	197	88	11,572	1	99*	11,957
500-foot Buffer	99	183	1,685	0	2,851	4,818
Total	**296**	**271**	**13,257**	**1**	**2,950**	**16,775**

*No data areas in the Project Footprint were located along fence line locations along the 500-foot buffer and Valley Floor Conservation Lands. None are wholly within the Project Footprint. The entire Project Footprint area was surveyed during the GKR survey.

Of the 11,190 total survey grid cells located within the Valley Floor Conservation Lands study area, approximately 10,001 survey grid cells were evaluated. A total of 896 of these grid cells were observed to be active at the time of the survey (9.0 percent of the cells evaluated). The 1,189 grid cells were not evaluated primarily due to lack of landowner access based on grazing operations or other restrictions. Table 4 describes the results of the GKR survey and Figure 4 depicts the results of the GKR survey on the VFCL within the study area.

Table 4 GKR survey results within the VFCL

	GKR Grid Cell Status

	Active	Inactive	No GKR	Relict GKR	No Data	Total
VFCL	896	740	8,364	1	1,189	11,190

VFCL = Valley Floor Conservation Lands

Of the 10,309 total survey grid cells located within the Silver Creek Ranch Conservation Lands study area; approximately 8,211 survey grid cells were evaluated. A total of 1,883 of these grid cells were observed to be active at the time of the survey (23.0 percent of the cells evaluated). The 2,098 grid cells were not evaluated due to lack of landowner access, terrain that was too steep to be safely accessed, or other reasons precluding surveyors from entering the grid cell. Table 5 describes the results of the GKR survey and Figure 5 depicts the results of the GKR survey on the Silver Creek Ranch Conservation Lands within the study area.

Table 5 GKR survey results within the SCRCL

	GKR Grid Cell Status					
	Active	Inactive	No GKR	Relict GKR	No Data	Total
SCRCL	1,883	1,414	4,914	0	2,098	10,309

SCRCL=Silver Creek Ranch Conservation Lands.

Of the 10,166 total survey grid cells located within the Valadeao Ranch Conservation Lands study area, approximately 6,973 survey grid cells were evaluated. A total of 58 of these grid cells were observed to be active at the time of the survey (1.0 percent of the cells evaluated). The 3,193 grid cells were not evaluated due to lack of landowner access, terrain that was too steep to be safely accessed, presence of bulls or other reasons precluding surveyors from entering the grid cell. Table 6 presents the results of the GKR survey and Figure 6 depicts the results of the GKR survey on the Valadeao Ranch Conservation Lands within the study area.

Table 6 GKR survey results within the VRCL

	GKR Grid Cell Status					
	Active	Inactive	No GKR	Relict GKR	No Data	Total
VRCL	58	48	6,866	1	3,193	10,166

VRCL = Valadeao Ranch Conservation Lands

Based on this most current survey information, a map of the active and inactive GKR cells was prepared and larger colonial concentrations were delineated. Four of the larger colony concentrations within the Project Footprint were converted to GKR avoidance areas and added to

the Valley Floor Conservation Land (approximately 58 percent of total active and inactive GKR blocks within the original Project Footprint). These areas were selected due to the large numbers of concentrated active and inactive GKR precincts, presence of high quality habitat, and direct connectivity to protected lands such as the Valley Floor Conservation Land, SJKF corridor, Valadeao Ranch Conservation Lands, and adjacent BLM landholdings. The summary above takes the move of the avoidance areas to the Conservation Lands into consideration.

The results of the 100 percent survey were used to generate estimates of the total number of GKR potentially supported in the Project Footprint. It was conservatively assumed that all 197 active cells were located in high quality GKR habitat even though habitat quality in the Project Footprint appears to be compromised over much of the occupied area due to past land use practices. An attempt was made to field verify the density of GKR per active cell, however, based on field conditions (heavy grazing), it was not possible to identify individually clipped precincts within the grid cells. Without performing systematic grid trapping study, it is assumed that each active cell within the Project Footprint is occupied with at least one individual GKR. This resulting assumed minimum density is within the range provided by Williams and above the density predicted by the habitat suitability model (HSM) for the Project.

Using this density estimate for GKR within the Project Footprint, a minimum of 197 GKR are expected to occur within the Project Footprint currently. Typically GKR populations can fluctuate significantly from year to year and within years, potentially leading to a population increase across the Project Footprint outside of the cells identified as active during the survey. A population increase would likely result in occupancy of at least the currently inactive GKR cells found within the Project Footprint. Therefore, a minimum reasonably expected estimate of the population potentially supported within the Project Footprint is 285 individual GKRs.

To account for possible increases in density from one year to the next, a potentially higher density should be assumed. Project Footprint densities of GKR are not available in literature. The only colony evaluated in Williams (1992) from the Valley Floor was not trapped and no density estimate specifically for that GKR colony was calculated. In the Panoche region, other density estimates are available for Silver Creek Ranch, the vicinity of Valadeao Ranch, and on the east side of the Panoche Region in the vicinity of Panoche Creek alluvial fan. Of these, the

Project Footprint is most likely more similar to Valadeao Ranch than Silver Creek Ranch or Panoche Creek, given the very high quality habitat conditions present on the latter two. Therefore, using the maximum measured density for the Valadeao Ranch area (7.90 GKR/acre), up to 506 GKR may be present within the Project Footprint.

GKR are a species that has periodic population irruptions, resulting in large increases in numbers of individuals and potentially large areas of adjacent habitat becoming occupied over very short time periods. Although these population increases may follow years of favorable precipitation, a direct causative link has not been determined. When these events occur, existing populations can increase greatly. While this type of population increase is an observed phenomenon, predicting the resulting population on a particular area (e.g. Project Footprint) is problematic and not the typical condition.

Although these population increases may follow years of favorable precipitation, a direct causative link has not been determined. When these events occur, existing populations can increase greatly. While this type of population increase is an observed phenomenon, predicting the resulting population on a particular area (e.g. Project Footprint) is problematic and not the typical condition.

San Joaquin Kit Fox

A variety of surveys intended to detect SJKF site use of the Project Footprint and Conservation Lands were conducted during 2009, 2010, 2012, and 2013. A summary of the results of these surveys is included in the following paragraphs.

Scat-sniffing Dog Surveys

Evidence of SJKF on the Project Footprint, and portions of VFCL and VRCL was gathered during scat-sniffing dog surveys conducted by Working Dogs for Conservation. These surveys were conducted onsite between July 30th and August 16th, 2010, walking 33.19 miles (53.42 kilometers [km]) of non-random transects. During these surveys, 52 fresh (< 8 days old) and 311 old scats (> 8 days old) were collected. Individual SJKF mark their territory with urine and feces, as well as use latrines several times per day. The scats collected during these surveys were sent to the Smithsonian to have Deoxyribonucleic Acid (DNA) analyzed. From these scats, 22 separate individual SJKF were identified in the study area of the Project Footprint, VFCL, and

VRCL (11 male and 11 female). Nine individuals were located on both the Project Footprint and Conservation Lands, and 13 individuals were located exclusively on the Conservation Lands. As the scat- sniffing dog surveys were conducted at the end of the summer of 2010, the data collected represents a good estimate of the number of individuals occurring in the study area for a good year (the winter of 2009-2010 was a year with high precipitation and 2010 was a year with a high density of prey species).

Scat was collected from up to 35 percent slopes, a slope that is much steeper than typically reported for this species. These results from empirical data defining slope use by SJKF in the local vicinity of the Project site is important to note, as species use landscapes differently in different locations and settings. Studies often report much lower slope ranges in the literature for this species, without defining what slopes were available for use in the study area (i.e., if all slopes in the study area are less than 15 percent, then SJKF use on slopes greater than 15 percent cannot accurately be assessed).

Spotlight Surveys

Spotlighting surveys on the SCRCL have been completed with 20.5 nights of spotlighting producing two to 10 SJKF observations per night. A total of 137 detections of SJKF and 11 detections classified as probable SJKF have occurred to date. It is important to note that kit foxes were detected within drainages, on flat land, on hill slopes, and even on ridges or hills. The SJKF observed on the SCRCL appear to use hills with much steeper slopes than previous literature suggests which is similar to the results of the scat-sniffing dog surveys on the VRCL.

Camera Trap Surveys

Twenty camera trap stations were set up on the Silver Creek Ranch Conservation Lands, and have recorded SJKF at 17 out of 20 stations. All camera traps were placed at least a half mile from each other. The 17 detections occurred on 119 of 275 trap nights, resulting in approximately 43 percent detection. Individual camera trap detections of SJKF ranged from 0 percent to almost 64 percent detection. Only one station detected two SJKF in the same photo, all other stations detected one individual at a time. As SJKF rarely exhibit unique identifying features, individuals are difficult to distinguish. Therefore, it is not possible to confirm the exact number of individuals that visited any given camera trap location.

SJKF Den Locations

Concurrent with the 2013 GKR surveys all known SJKF den and known SJKF natal den locations were recorded and mapped. A total of 46 SJKF dens were observed within the study area (37 known adult dens and 8 natal dens). Table 7 presents the results by study area component and Figure 7 shows the locations of these dens within the study area.

Table 7 San Joaquin Kit Fox Den Observations

	Project Footprint	VFCL	SCRCL	VRCL	Total
Known Dens	2	17	7	11	**37**
Known Natal Dens	1	5	1	1	**8**
Total	**3**	**22**	**8**	**12**	**46**

Habitat Suitability

The Project will be preserving over 24,000 acres that benefit the SJKF. However, any lands with greater than 11 percent slopes were presumed to be less than optimally suitable. This decision was made based on scat-sniffing dog results on the Project site, Valley Floor Conservation Lands, and part of the Valadeao Ranch Conservation Lands. The proportion of lands considered suitable for SJKF was contingent upon the slope values such that, for example, 100% of lands with <11% slopes were considered suitable but only 50% of lands with 11.01-21% slopes was considered suitable. The scale used for ranking is described in Table 8.

Table 8 Slope Classes and SJKF Scat

Slope Class	Scats Collected in This Slope Class	Prorated Habitat Suitability Acres	Acres of Land: Acres of Suitable Habitat
0-11%	70%	100% Suitable	1 : 1
11.01-21%	18.5%	50% Suitable	1 : 0.5
21.01-35%	11.5%	25% Suitable	1 : 0.25
>35%	0%*	0% Not Suitable	1 : 0

The Project Footprint contains 2,492 acres of suitable SJKF habitat. The Conservation Lands contain approximately 14,863 acres of suitable SJKF habitat according to this method. It is important to note that the Conservation Lands contain over 24,000 acres that would be managed

for and could potentially be used by SJKF.

Valley Floor Conservation Lands located on the southern portion of the Project Footprint would remain intact (undisturbed and unfragmented), thus allowing SJKF to continue to disperse across this portion of the Project Footprint. Additionally, the Valley Floor Conservation Lands incorporated in washes provides for increased connectivity for dispersing SJKF throughout the total Project Footprint.

California Tiger Salamander

A total of 12 ponds are present on the VFCL and the VRCL and just outside these areas (see Table 9 and Figure 8); three ponds are offsite, five are within the VRCL and four are within VFCL. CTS were documented in two ponds (Ponds #3 and #12) and documented historic occurrences in two ponds (Ponds #8 and #9) (see Figure 8); one pond offsite, one on the VRCL, and two within the VFCL. No larvae or adult CTS were detected within the Project Footprint but historically CTS have been documented in the major drainages within the VFCL. Ponds #8 and #9 are no longer considered suitable for CTS, but they will be monitored as will all ponds on these Conservation Lands.

Table 9. Ponds Surveys during Protocol CTS Larval Surveys, March, April, and May, 2010

Location #	Habitat Type	Findings	Dry by Date
01	Stock Pond	Clam Shrimp	Still Hydrated 21 May
02	Old Stock Pond	None	21 May (completely dry)
03	Stock Pond	CTS Larvae	Still Hydrated 21 May
04	2 Stock Ponds	None	21 May (completely dry)
05	Old Stock Pond	None	12 April (completely dry)
06	Stock Pond	None	21 May (completely dry)
07	2 Old Stock Ponds	None	21 April (almost dry)
08	Ephemeral Pool Complex	None	21 May (only 1 pool hydrated)
09	3 New Stock Ponds	None	21 May (only 2 pools hydrated)
10	Ephemeral Pool Complex	None	21 May (completely dry)
11	Old Stock Pond	None	Still Hydrated
12	Stock Pond	CTS Larvae	Drying fast 21 May

Four of the five ponds and 4,028.1 acres of potential estivation habitat (including 669.7 acres within 0 to 2,100 feet of breeding habitat; 287.2 acres between 2,100 to 2,640 feet from breeding

habitat; and 3,071.2 acres between 2,640 to 6,336 feet from breeding habitat) will be permanently protected on Conservation Lands. Suitable aestivation habitat is considered grasslands within 6,336 feet of breeding ponds (see hatch on Figure 8). The current status of CTS on the SCRCL is undetermined at this time. No surveys occurred on the SCRCL for CTS; however, at least two manmade ponds support potential habitat. Ponds on the SCRCL will be monitored for at least three years; where CTS are detected; those ponds and associated aestivation habitat will be added to conservation acreage for this species.

San Joaquin Antelope Squirrel

Conditions were suitable for observation of this species during all BNLL surveys and many of the other surveys conducted for Covered Species associated with the Project Footprint and Conservation Lands. A single observation of an SJAS was recorded during GKR surveys on the Project Footprint. During that same period, one observation was recorded on VRCL and 13 observations were recorded on SCRCL. These observations each represented individual SJAS as they were recorded during a single survey effort. During the BNLL protocol surveys between June and September 2013, SJAS observations were recorded as follows: Project Footprint (30); VFCL (5) and VRCL (14) (Figure 9). Many of these observations that were likely the same individual observed multiple times over the survey period.

SJAS were regularly observed in the more diverse habitats on the VRCL and SCRCL during surveys conducted in 2009, 2010, and 2012 by Live Oak Associates, Inc. (LOA). The entire acreage of the Conservation Lands is considered suitable mitigation for this species. Based on these results, SJAS are expected to occur on the Project Footprint in very low numbers. Three individuals were observed within the Project Footprint during various surveys conducted in 2009, two individuals were detected on the VFCL, and seven on the VRCL during 2010 surveys. The overall population levels of this species on the VFCL and the VRCL is considered low; however, on the SCRCL, SJAS populations are considered high, with hundreds observed throughout most of the SCRCL during 2010 reconnaissance surveys, in addition, 119 were observed incidentally in a two-week period in September of 2012.

California Condor

Although the CACO has not been observed over the site to date, it may pass over and/or forage

over the site from time to time. One of the active CACO release sites is located at Pinnacles National Monument in the Gabilan Mountains of San Benito County. Pinnacles National Monument is located approximately

16 flight miles southwest of the Project Footprint. As of May 2013, this population stood at 25 "free-flying" individuals (USFWS 2013). No critical habitat for the CACO has been designated in San Benito County. The California Natural Diversity Database (CNDDB) has no records of the CACO in San Benito County, even though Pinnacles National Monument is an active release site in the county.

No suitable nesting habitat exists on the Project Footprint or Conservation Lands. Although possible foraging habitat may exist on the Project Footprint and Conservation Lands, the CACO has not been observed during other biological surveys onsite (including ongoing golden eagle/raptor use surveys). According to the USFWS, radio-tracking surveys of released CACO have identified this species occurring over the Project Footprint while in flight, likely while foraging.

Aerial nest surveys targeting nesting golden eagles did not identify any potential CACO nests within ten miles of the Project footprint. The Conservation Lands shall provide habitat preservation. VFCL will conserve approximately 2,523 acres of suitable CACO foraging habitat. Conservation Lands on the VRCL and SCRCL will include approximately 10,772 acres and 10,890 acres of suitable CACO foraging habitat, respectively. When combined, Conservation Lands will total approximately 24,185 acres of suitable CACO foraging habitat.

Vernal Pool Fairy Shrimp

One-hundred and twenty-one (121) ephemeral pools were identified within the Project Footprint, which were classified as ephemeral drainages within seasonal drainages (50 features; 1.88 acres), road puddle or roadside ditch (36 features; 0.22 acres), stock pond (5 features; 0.34 acres), trough puddles that were created by livestock around leaky troughs (15 features; 0.13 acres), and vernal pools (15 features; 0.26 acres; Figure 10).

The winter 2010 Protocol Vernal Pool Branchiopod Surveys identified VPFS within the study area in one pool, a small berm pond located along the boundary of Sections 4 and 9. One other

pool, created by excavated dirt used for the berm around the occupied pool, was identified as hydrologically connected with the VPFS occupied pool. VPFS were not found in any other potential habitat throughout the project site or the VRCL (Figure 11).

Conservancy Fairy Shrimp

One-hundred and twenty-one (121) ephemeral pools were identified within the Project Footprint, which were classified as ephemeral drainages within seasonal drainages (50 features; 1.88 acres), road puddle or roadside ditch (36 features; 0.22 acres), stock pond (5 features; 0.34 acres), trough puddles that were created by livestock around leaky troughs (15 features; 0.13 acres), and vernal pools (15 features; 0.26 acres; Figure 10).

The 2005 USFWS Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon does not note any extant populations of CFS in San Benito County. The CNDDB has no records of CFS occurring in the Project Footprint or on U.S. Geologic Service (USGS) quads or the encompassing quads. No critical habitat for CFS has been designated in San Benito County.

No CFS were observed on the Project Footprint or the VFCL and VRCL during winter 2010 Protocol Vernal Pool Branchiopod Surveys.

Longhorn Fairy Shrimp

One-hundred and twenty-one (121) ephemeral pools were identified within the Project Footprint, which were classified as ephemeral drainages within seasonal drainages (50 features; 1.88 acres), road puddle or roadside ditch (36 features; 0.22 acres), stock pond (5 features; 0.34 acres), trough puddles that were created by livestock around leaky troughs (15 features; 0.13 acres), and vernal pools (15 features; 0.26 acres; Figure 10).

The 2005 USFWS Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon does not note any extant populations of LHFS in San Benito County. The CNDDB has no records of LFS occurring in the Project Footprint or the encompassing USGS quads. No critical habitat for LFS has been designated in San Benito County.

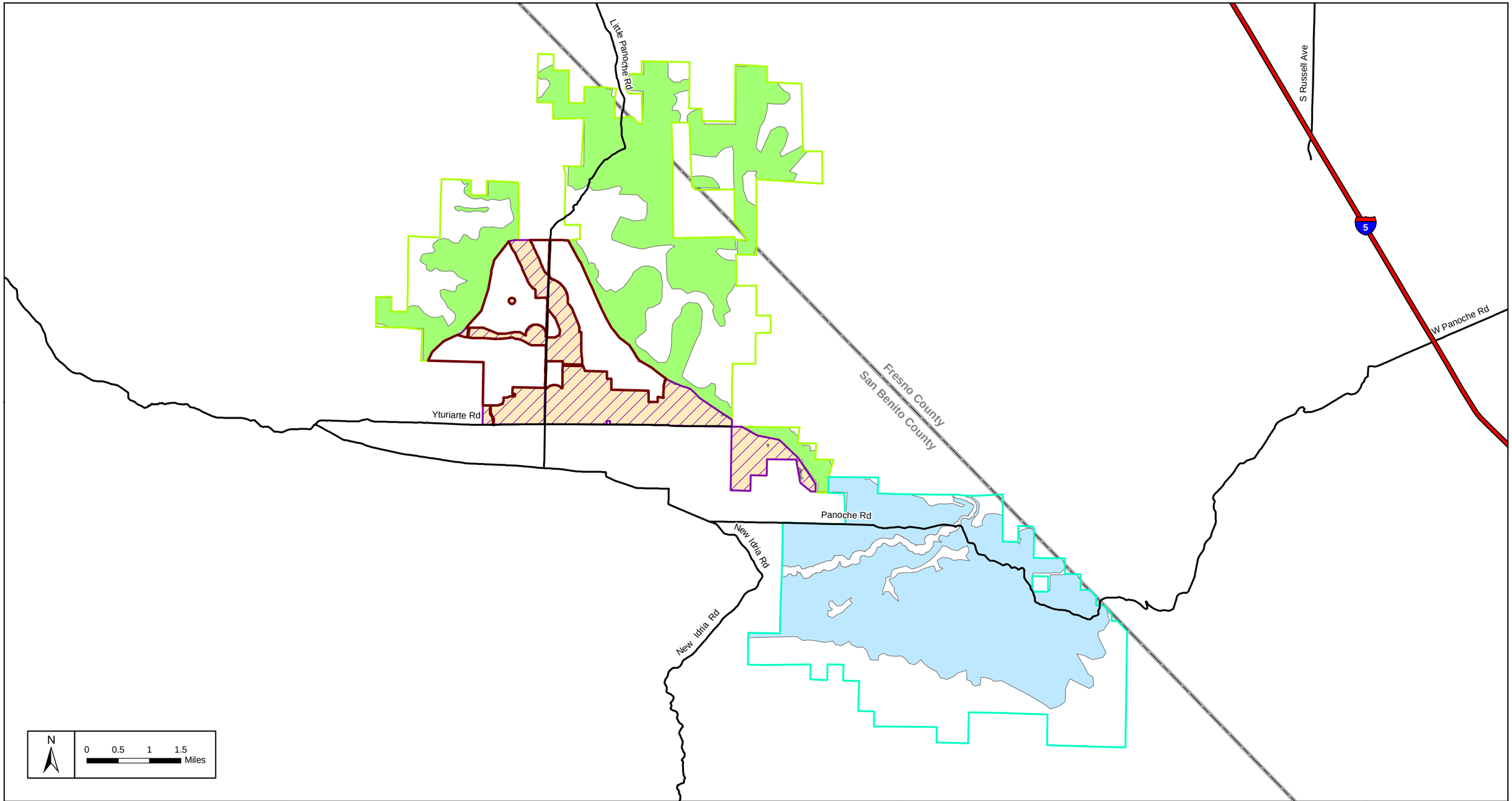
No LFS were observed on the Project Footprint or the VFCL and VRCL during winter 2010 Protocol Vernal Pool Branchiopod Surveys.

Vernal Pool Tadpole Shrimp

One-hundred and twenty-one (121) ephemeral pools were identified within the Project Footprint, which were classified as ephemeral drainages within seasonal drainages (50 features; 1.88 acres), road puddle or roadside ditch (36 features; 0.22 acres), stock pond (5 features; 0.34 acres), trough puddles that were

The 2005 USFWS Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon does not note any extant populations of VPTS in San Benito County. The CNDDB has no records of VPTS occurring within the Project Footprint or the encompassing USGS quads. No critical habitat for VPTS has been designated in San Benito County.

No VPTS were observed in the Project Footprint or the VFCL during winter 2010 Protocol Vernal Pool Branchiopod Surveys. However, VPTS were observed in one pool on the VRCL during the winter 2010 Protocol Vernal Pool Branchiopod Surveys.



305 Camp Craft Road, Suite 575
West Lake Hills, Texas 78746
512-222-1125
www.energyrenewalpartners.com
Energy Renewal
PARTNERS, LLC

Legend

- Project Footprint
- Valley Floor Conservation Lands
- Valley Floor Suitable Habitat *(approx. 2507 acres)*
- Valadeao Ranch Conservation Lands
- Valadeao Ranch Suitable Habitat *(approx. 6598 acres)*
- Silver Creek Ranch Conservation Lands
- Silver Creek Ranch Suitable Habitat *(approx. 7149 acres)*

Panoche Valley Solar Project

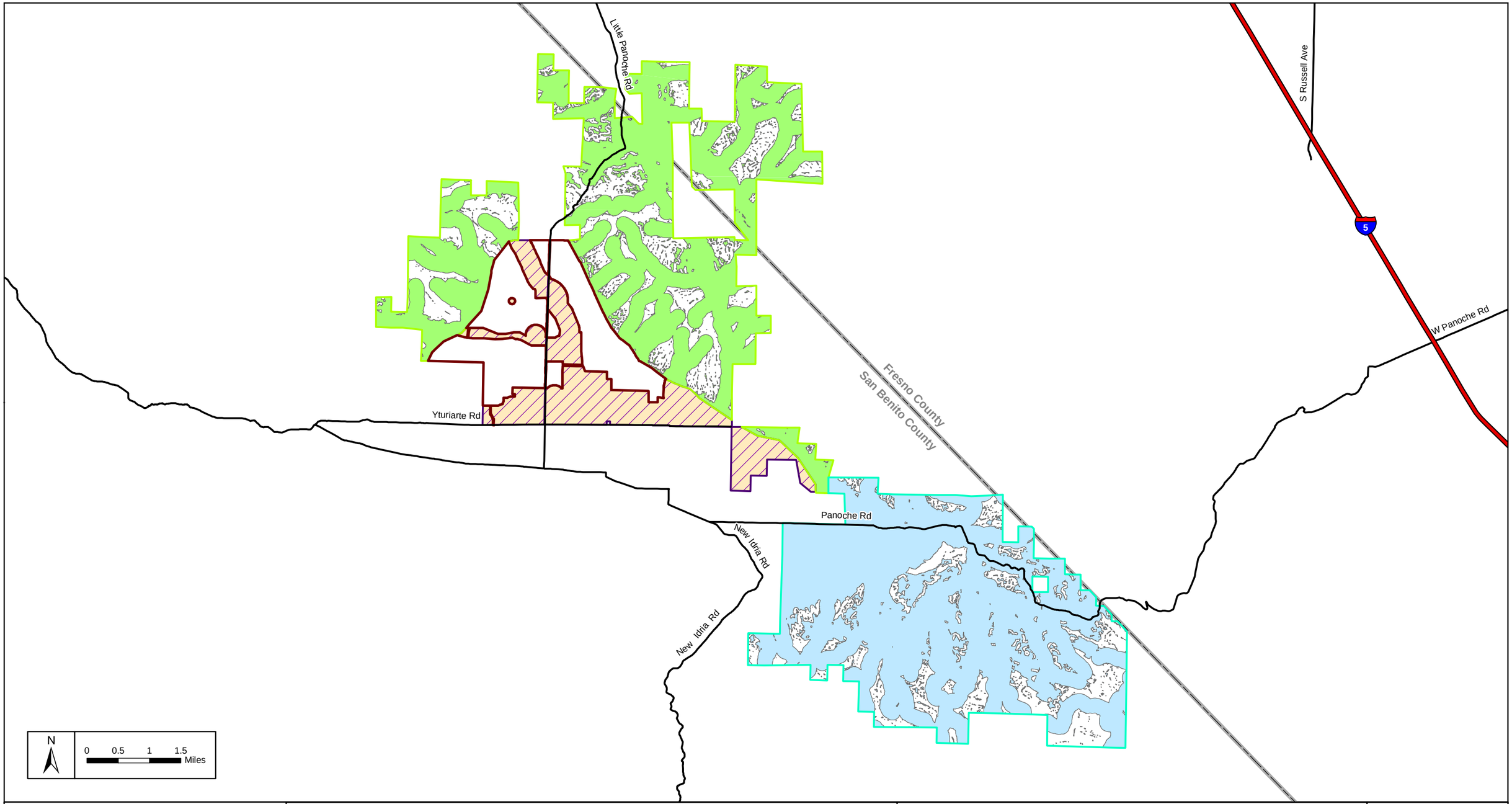
Giant Kangaroo Rat Mitigation Lands*

*For the purpose of this figure, data from Live Oak Associates was used for the Valadeao and Silver Creek Ranches, and clipped to the boundaries as shown. Locations with a slope between 0 and 11% were used for the Valley Floor Conservation Lands.

FIGURE

1

JH 2015-05-29



305 Camp Craft Road, Suite 575
West Lake Hills, Texas 78746
512-222-1125
www.energyrenewalpartners.com
Energy Renewal
PARTNERS, LLC

Legend

- Project Footprint
- Valley Floor Conservation Lands
- Valley Floor Suitable Habitat (approx. 2,514 acres)
- Valadeao Ranch Conservation Lands
- Valadeao Ranch Suitable Habitat (approx. 7,876 acres)
- Silver Creek Ranch Conservation Lands
- Silver Creek Ranch Suitable Habitat (approx. 8,824 acres)

Panoche Valley Solar Project

Blunt-nosed Leopard Lizard Mitigation Lands*

*For the purpose of this analysis, locations with a slope between 0% and 11% or within 625 feet of an area of drainage are considered suitable BNLL habitat.

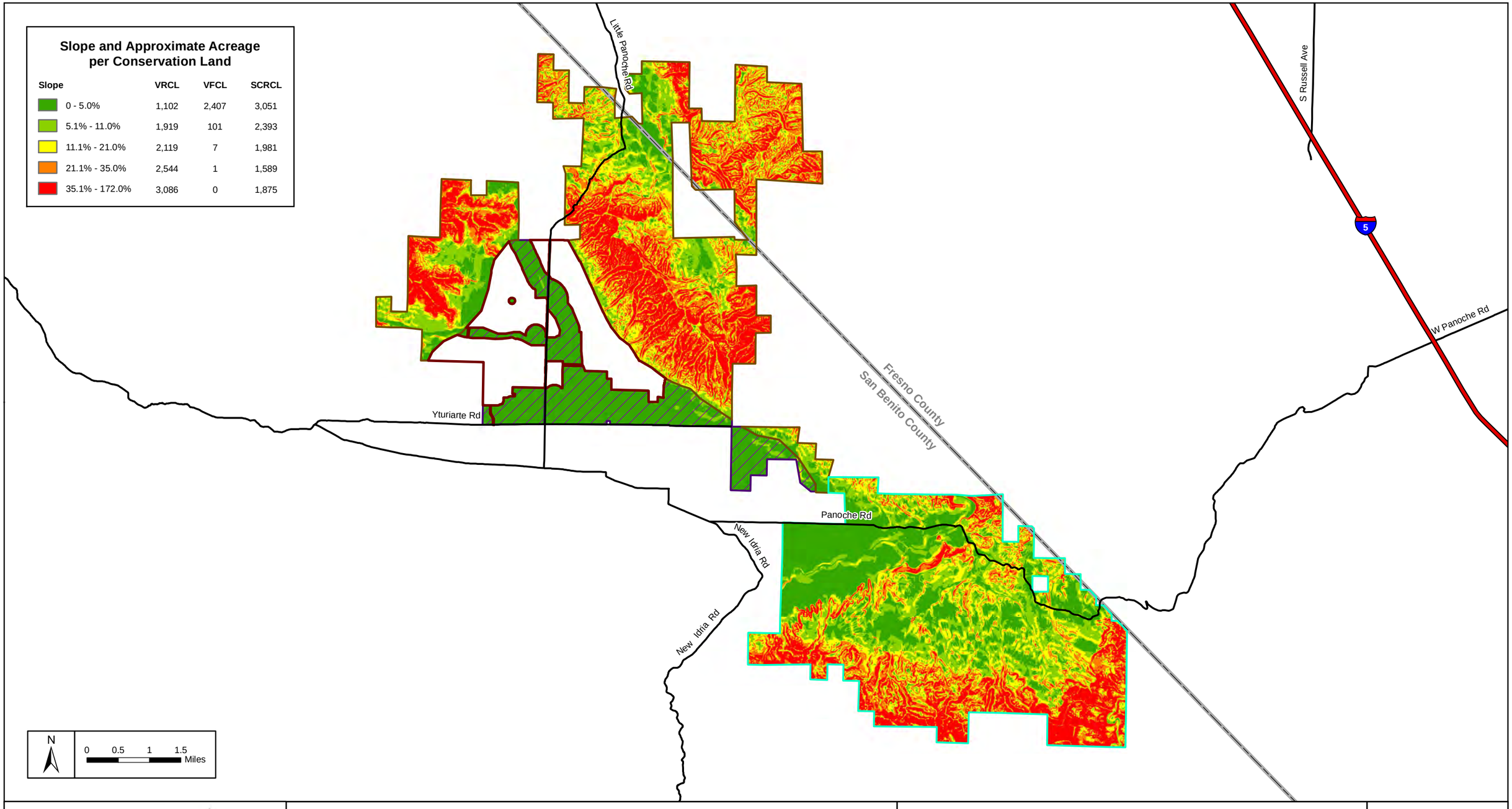
FIGURE

3

JH 2015-05-29

Slope and Approximate Acreage per Conservation Land

Slope	VRCL	VFCL	SCRCL
0 - 5.0%	1,102	2,407	3,051
5.1% - 11.0%	1,919	101	2,393
11.1% - 21.0%	2,119	7	1,981
21.1% - 35.0%	2,544	1	1,589
35.1% - 172.0%	3,086	0	1,875



305 Camp Craft Road, Suite 575
West Lake Hills, Texas 78746
512-222-1125
www.energyrenewalpartners.com
Energy Renewal PARTNERS, LLC

Legend

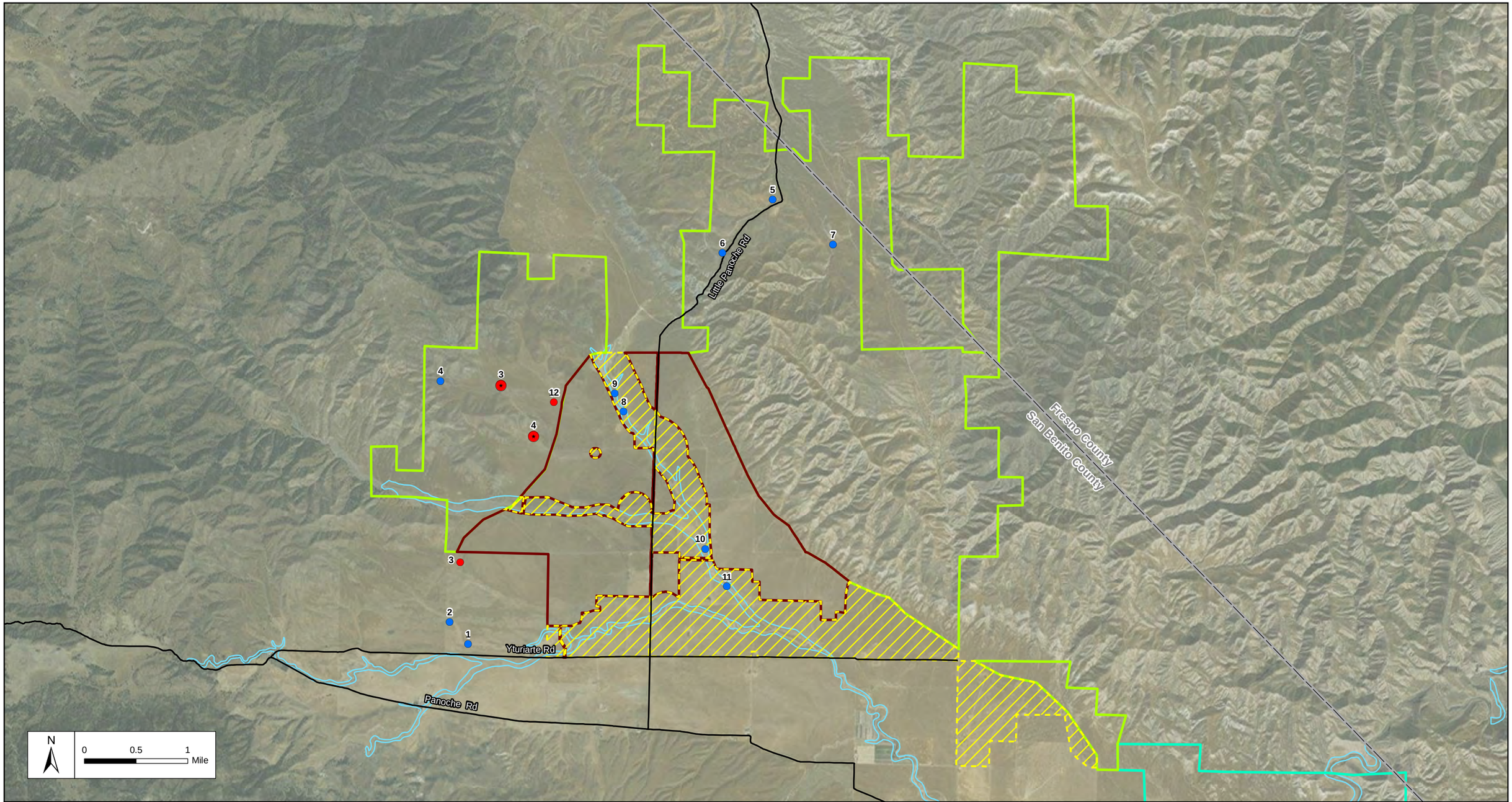
- Project Footprint
- Valley Floor Conservation Lands
- Valadeao Ranch Conservation Lands
- Silver Creek Ranch Conservation Lands

Panoche Valley Solar Project

San Joaquin Kit Fox Mitigation Lands

FIGURE 2

JH 2015-05-29



305 Camp Craft Road, Suite 575
West Lake Hills, Texas 78746
512-222-1125
www.energyrenewalpartners.com
Energy Renewal
PARTNERS, LLC

Legend

- Project Footprint
- Valley Floor Conservation Lands
- Valadeao Ranch Conservation Lands
- Silver Creek Ranch Conservation Lands
- Potential Mitigation Pond Location
- Surveyed Breeding Pond
- Surveyed Pond
- 100-Year Floodplain

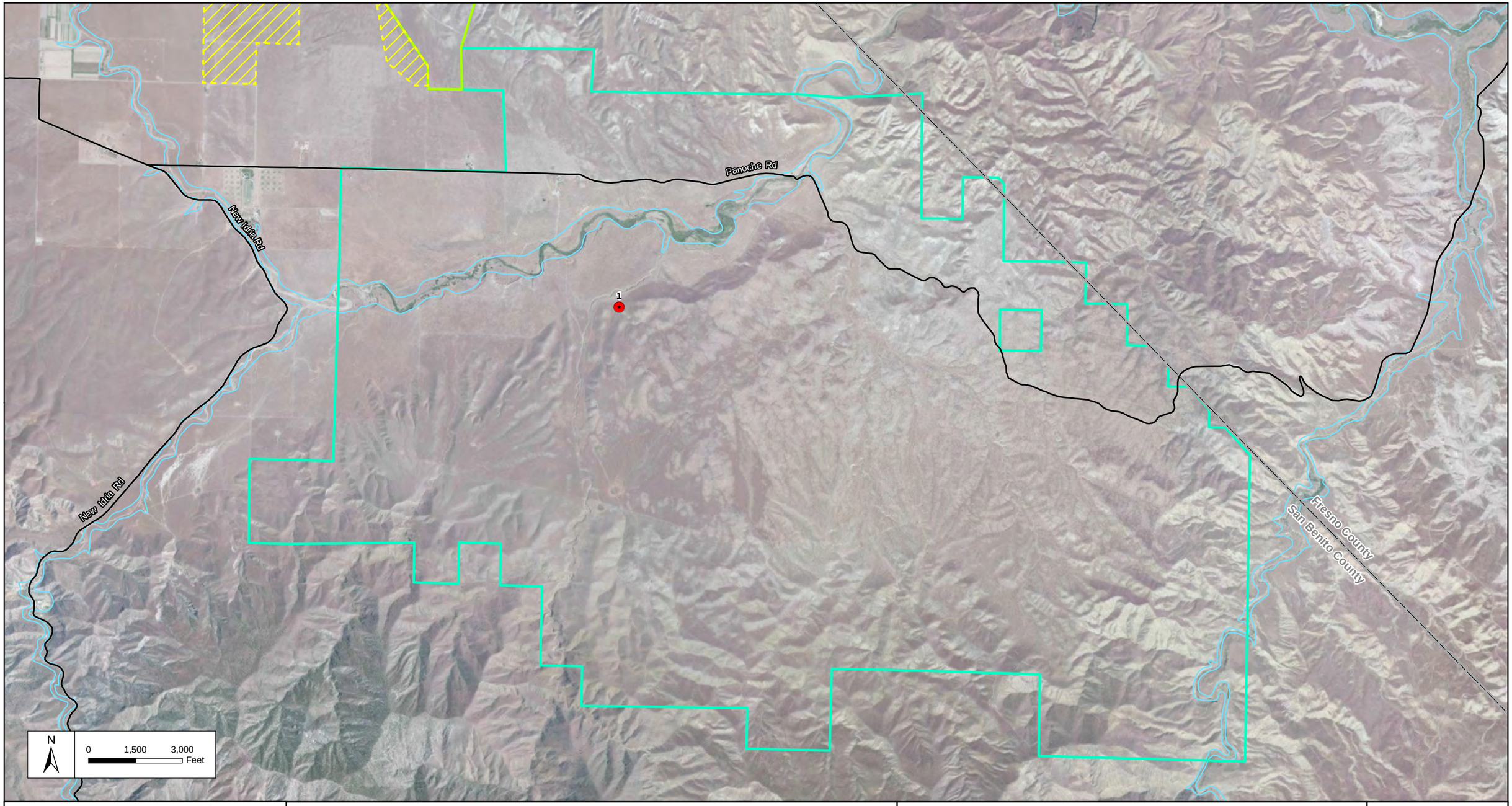
Panoche Valley Solar Project

Valadeao Ranch Conservation Lands
California Tiger Salamander Potential Mitigation Ponds

FIGURE

4

JH 2015-05-29



305 Camp Craft Road, Suite 575
West Lake Hills, Texas 78746
512-222-1125
www.energyrenewalpartners.com
Energy Renewal PARTNERS, LLC

Legend

- Silver Creek Ranch Conservation Lands
- Valadeao Ranch Conservation Lands
- Valley Floor Conservation Lands
- Potential Mitigation Pond Location
- 100-Year Floodplain

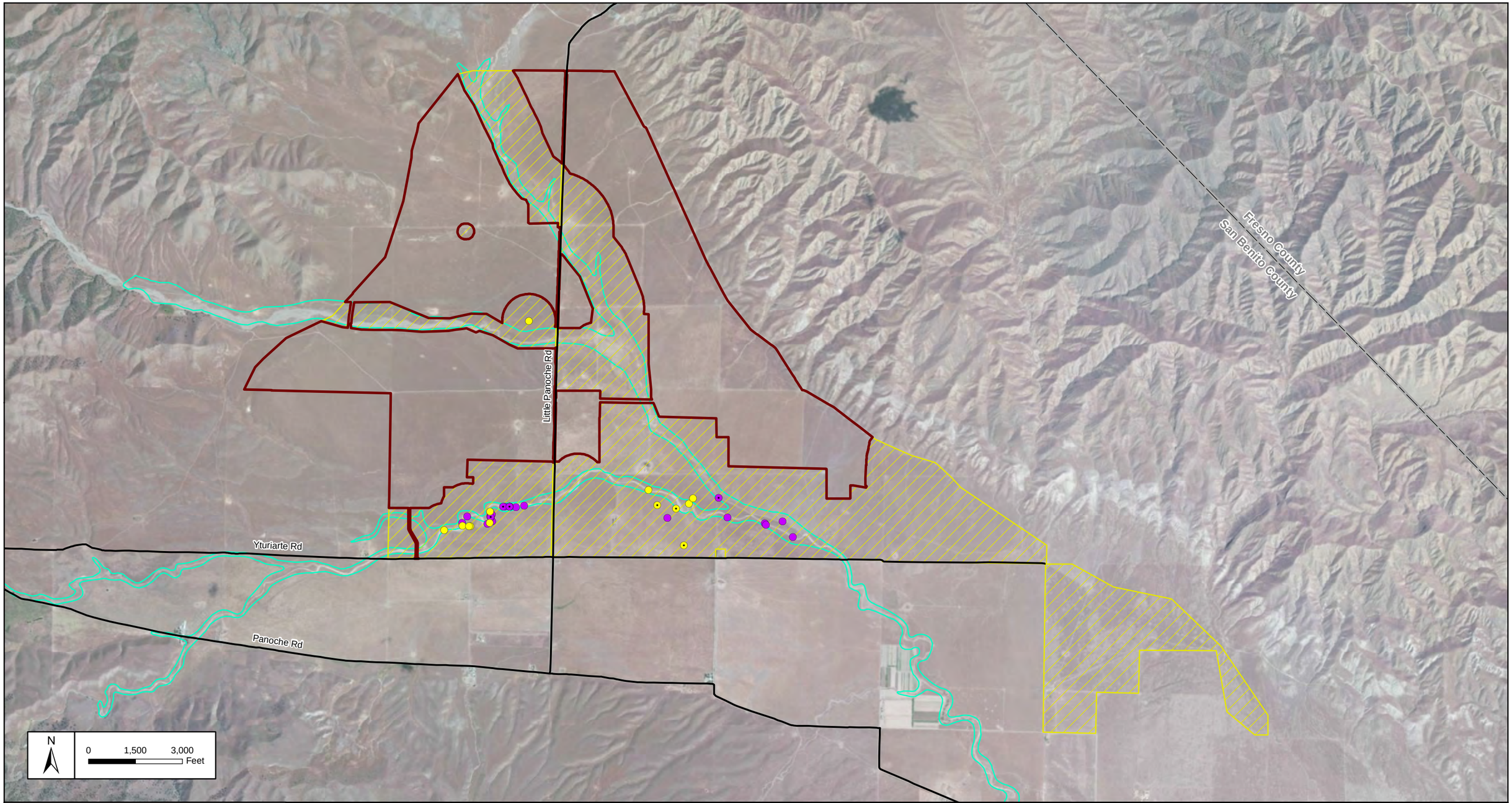
Panoche Valley Solar Project

Silver Creek Ranch Conservation Lands
California Tiger Salamander Potential Mitigation Ponds

FIGURE

5

JH 2015-05-29



305 Camp Craft Road, Suite 575
West Lake Hills, Texas 78746
512-222-1125
www.energyrenewalpartners.com
Energy Renewal
PARTNERS, LLC

Legend

- Project Footprint
- Valley Floor Conservation Lands
- 100-Year Floodplain
- 2013 Adult BNLL Observation (In Protocol)
- 2013 Adult BNLL Observation (Incidental)
- 2013 Hatchling/Sub-Adult Observation (In Protocol)
- 2013 Hatchling/Sub-Adult Observation (Incidental)

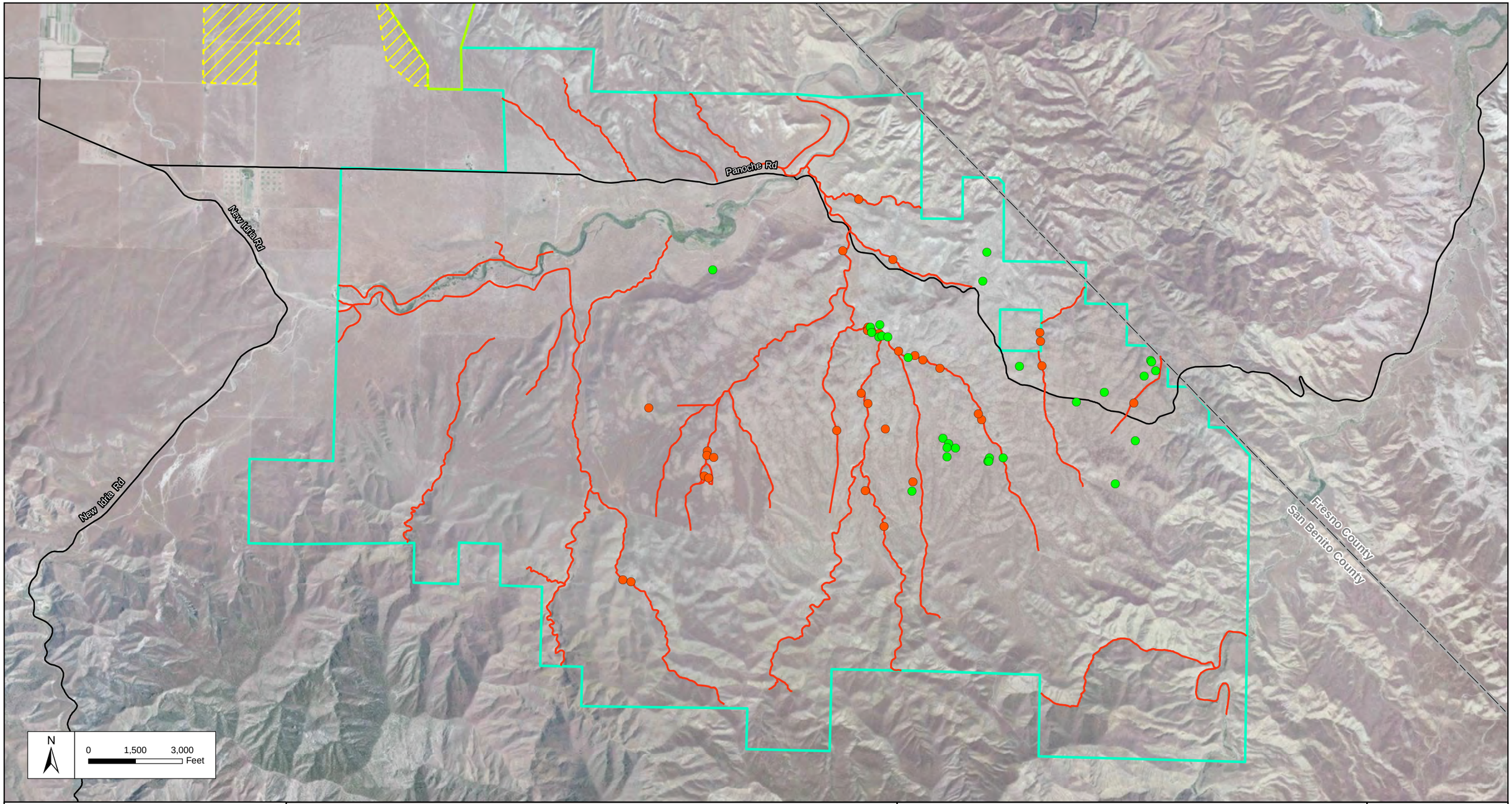
Panoche Valley Solar Project

2013 Bunt-nosed Leopard Lizard Protocol Survey Results

FIGURE

6

JH 2015-05-29



305 Camp Craft Road, Suite 575
West Lake Hills, Texas 78746
512-222-1125
www.energyrenewalpartners.com
Energy Renewal
PARTNERS, LLC

Legend

- Silver Creek Ranch Conservation Lands
- Valadeao Ranch Conservation Lands
- Valley Floor Conservation Lands
- BNLL Observation During Focused Surveys
- Incidental BNLL Observation
- BNLL Focused Survey Route

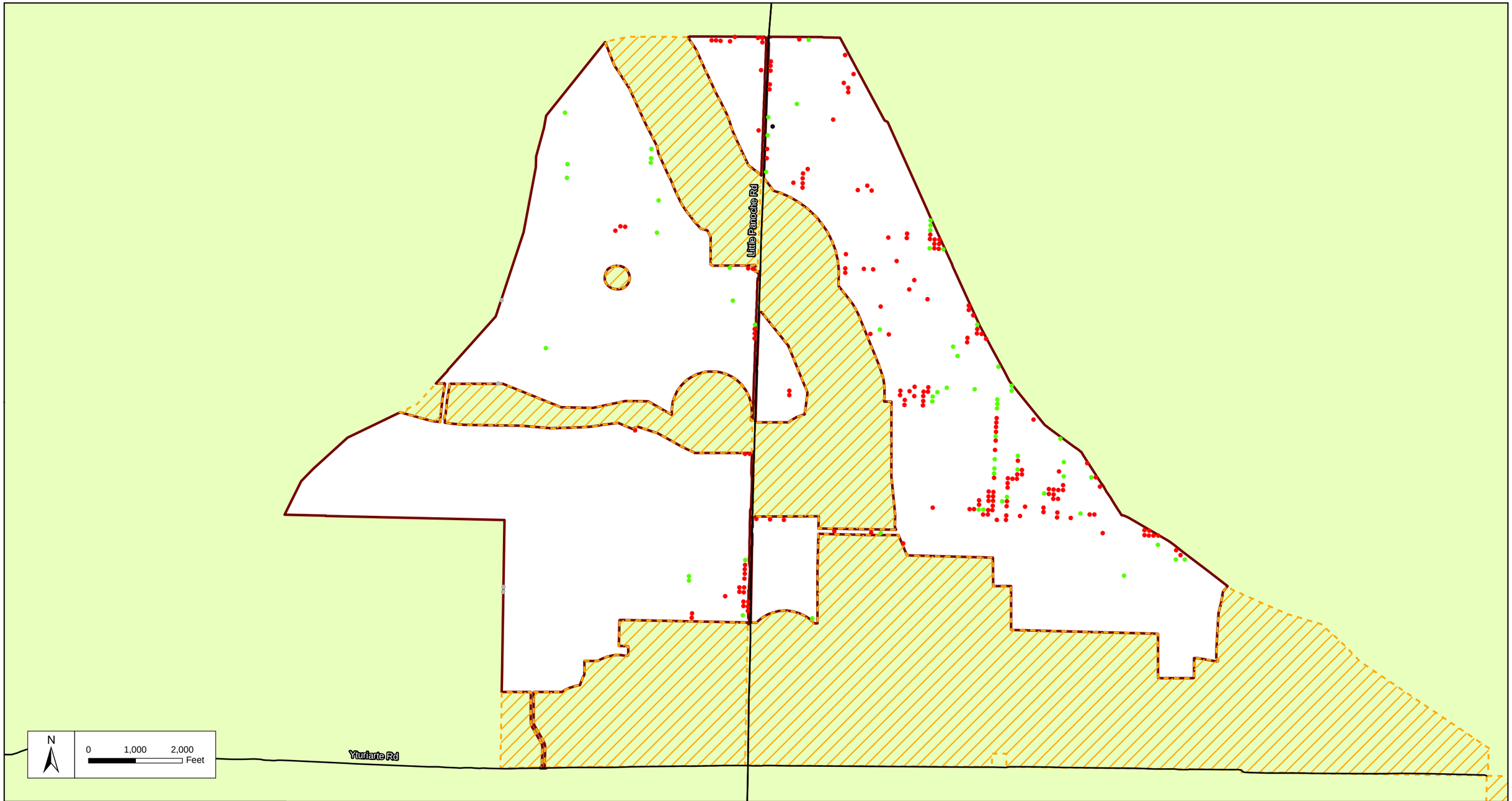
Panoche Valley Solar Project

Blunt-nosed Leopard Lizard Observations on Silver Creek Ranch Conservation Lands

FIGURE

7

JH 2015-05-31



305 Camp Craft Road, Suite 575
West Lake Hills, Texas 78746
512-222-1125
www.energyrenewalpartners.com
Energy Renewal
PARTNERS, LLC

Legend

- Project Footprint
- Valley Floor Conservation Lands
- GKR Evidence, Active
- GKR Evidence, Inactive
- Relict GKR Sign Present
- No Data

Panoche Valley Solar Project

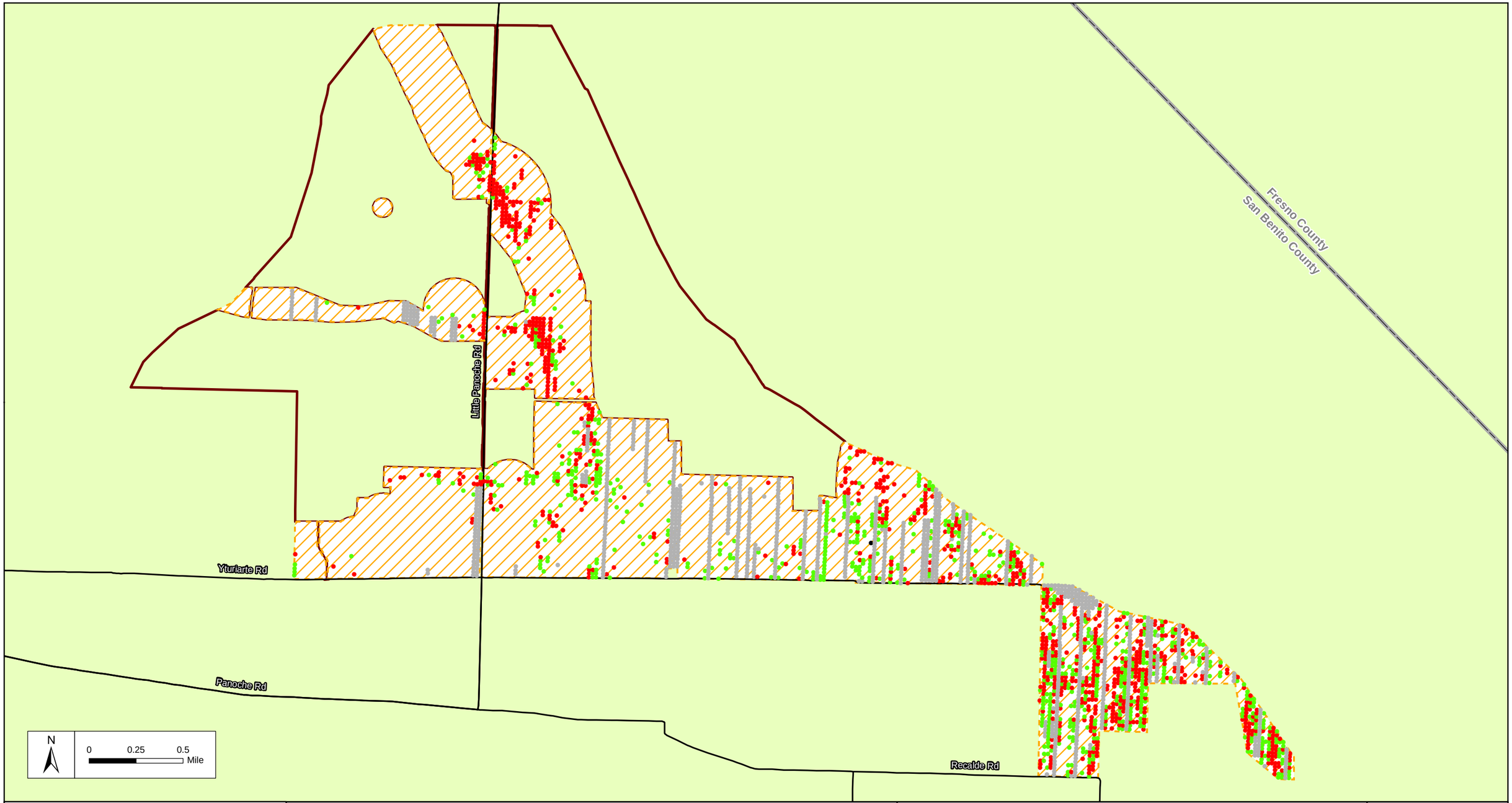
2013 Giant Kangaroo Rat Observations

Project Footprint

FIGURE

8

JH 2015-05-31



305 Camp Craft Road, Suite 575
West Lake Hills, Texas 78746
512-222-1125
www.energyrenewalpartners.com
Energy Renewal
PARTNERS, LLC

Legend

- Project Footprint
- Valley Floor Conservation Lands
- GKR Evidence, Active
- GKR Evidence, Inactive
- Relict GKR Sign Present
- No Data

Panoche Valley Solar Project

2013 Giant Kangaroo Rat Observations

Valley Floor Conservation Lands

FIGURE

9

JH 2015-05-31

Recalde Rd

Dan Berg Rd

Panoche Rd

New Idria Rd

New Idria Rd

Panoche Rd

Fresno County

San Benito County

N

0 1,500 3,000 Feet

305 Camp Craft Road, Suite 575
West Lake Hills, Texas 78746
512-222-1125
www.energyrenewalpartners.com

Energy Renewal PARTNERS, LLC

Legend

- Silver Creek Ranch Conservation Lands
- Valadeao Ranch Conservation Lands
- Valley Floor Conservation Lands
- GKR Evidence, Active
- GKR Evidence, Inactive
- No Data

Panoche Valley Solar Project

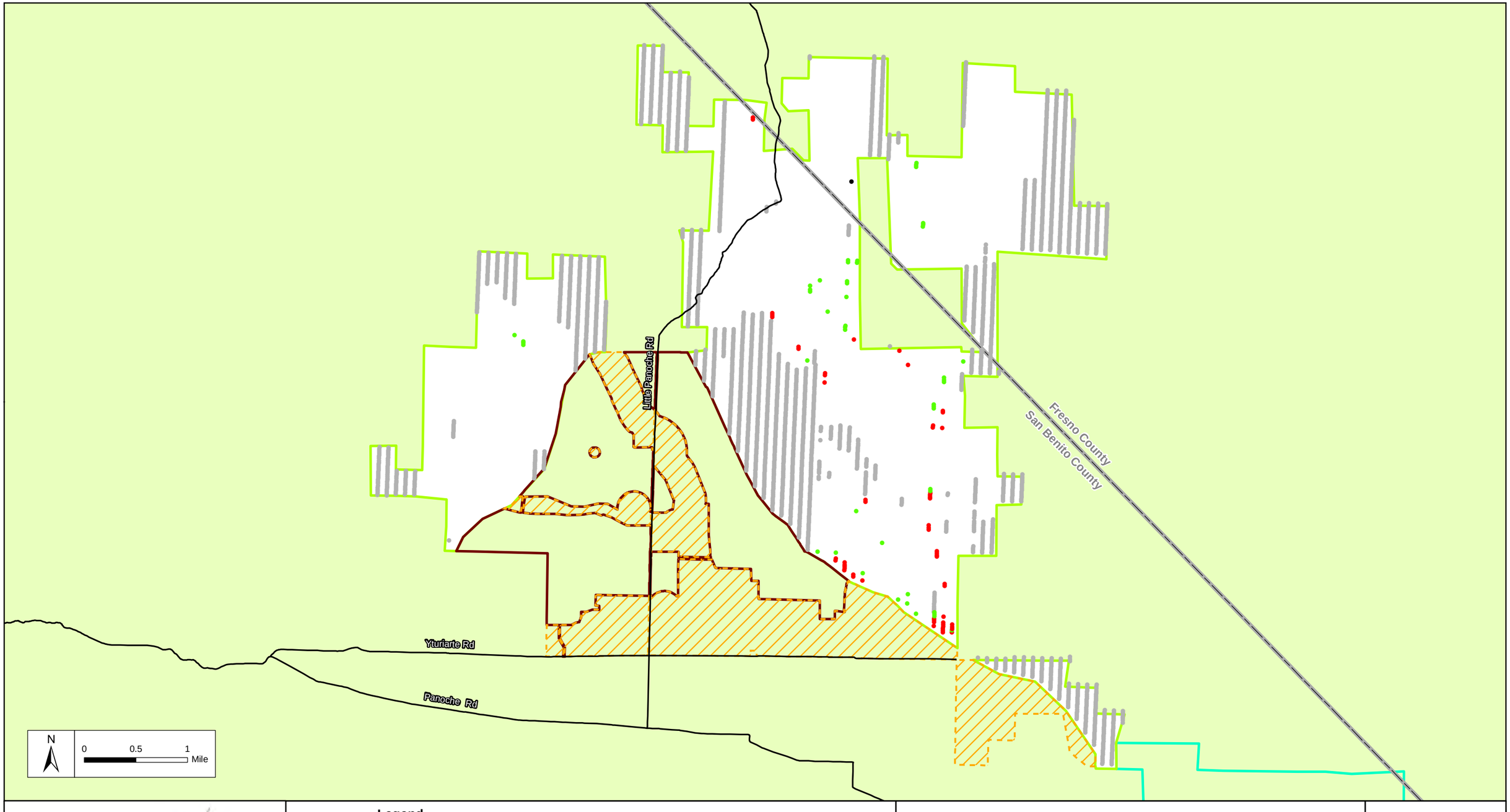
2013 Giant Kangaroo Rat Observations

Silver Creek Ranch Conservation Lands

FIGURE

10

JH 2015-05-31



305 Camp Craft Road, Suite 575
West Lake Hills, Texas 78746
512-222-1125
www.energyrenewalpartners.com
Energy Renewal
PARTNERS, LLC

Legend

- Project Footprint
- Valley Floor Conservation Lands
- Valadeao Ranch Conservation Lands
- Silver Creek Ranch Conservation Lands
- GKR Evidence, Active
- GKR Evidence, Inactive
- Relict GKR Sign Present
- No Data

Panoche Valley Solar Project

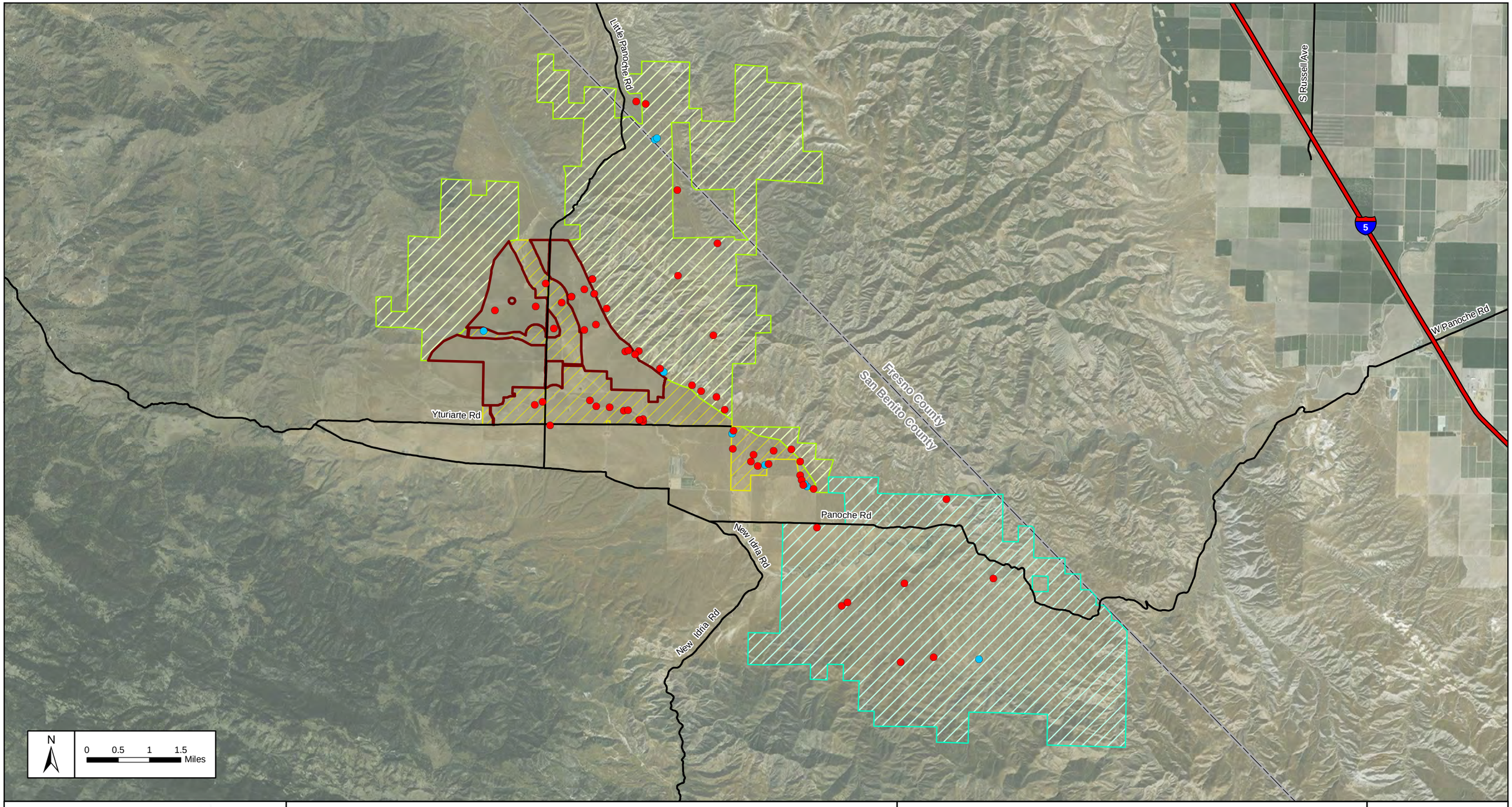
2013 Giant Kangaroo Rat Observations

Valadeao Ranch Conservation Lands

FIGURE

11

JH 2015-05-31



305 Camp Craft Road, Suite 575
West Lake Hills, Texas 78746
512-222-1125
www.energyrenewalpartners.com
Energy Renewal
PARTNERS, LLC

Legend

- Project Footprint
- Valley Floor Conservation Lands
- Valadeao Ranch Conservation Lands
- Silver Creek Ranch Conservation Lands
- Natal / Pupping Den
- Known Den

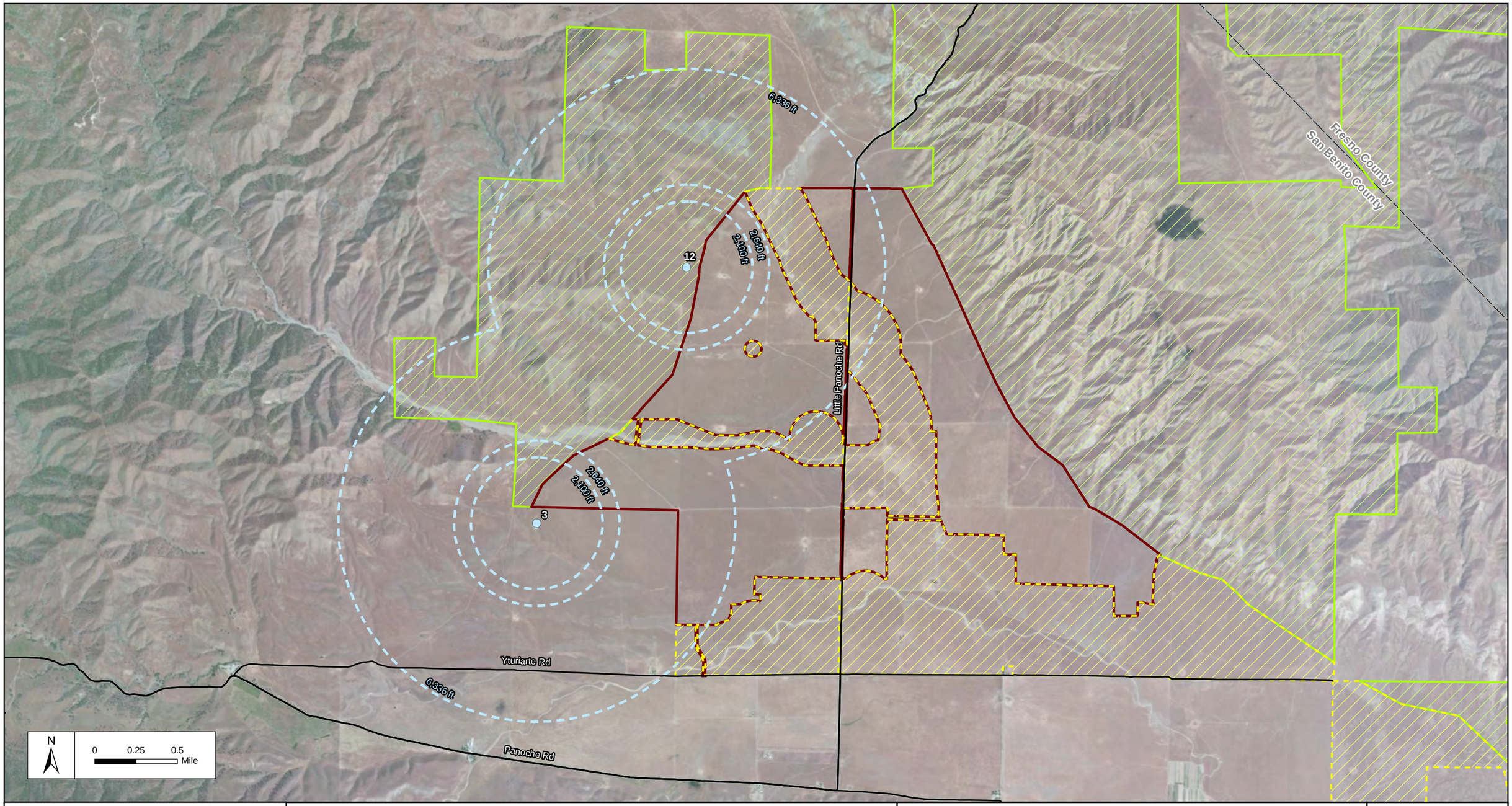
Panoche Valley Solar Project

San Joaquin Kit Fox Den Locations

FIGURE

12

JH 2015-05-31



305 Camp Craft Road, Suite 575
West Lake Hills, Texas 78746
512-222-1125
www.energyrenewalpartners.com
Energy Renewal
PARTNERS, LLC

Legend

- Project Footprint
- Valley Floor Conservation Lands
- Valadeao Ranch Conservation Lands
- Known CTS Breeding Pond
- CTS Pond Buffer

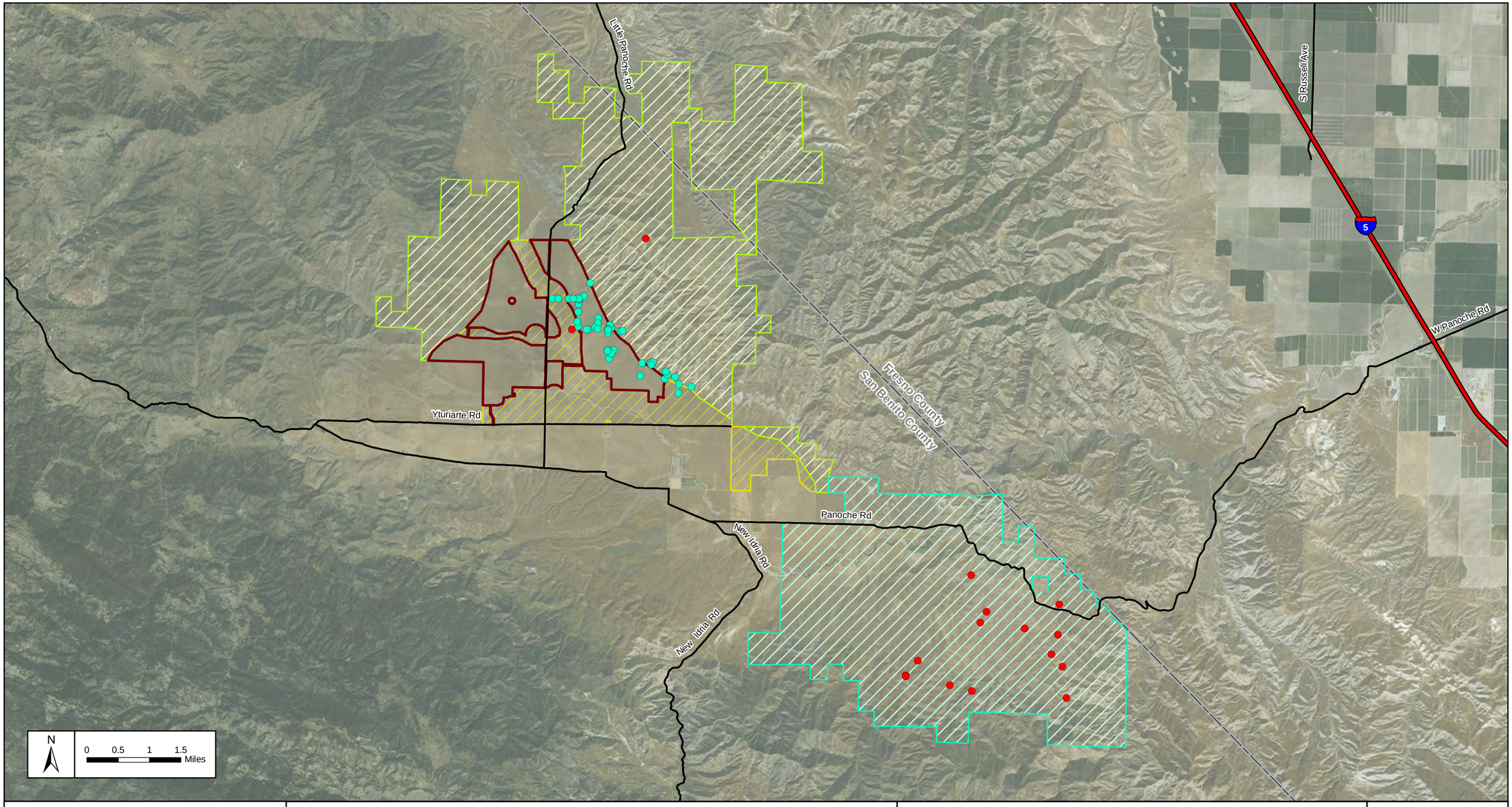
Panoche Valley Solar Project

Known California Tiger Salamander Breeding Ponds Outside Project Footprint and Valley Floor Conservation Lands

FIGURE

13

JH 2015-05-31



305 Camp Craft Road, Suite 575
West Lake Hills, Texas 78746
512-222-1125
www.energyrenewalpartners.com
Energy Renewal
PARTNERS, LLC

Legend

- Project Footprint
- Valley Floor Conservation Lands
- Valadeao Ranch Conservation Lands
- Silver Creek Ranch Conservation Lands
- Observation Location Feb - Apr
- Observation Location Jun - Sep

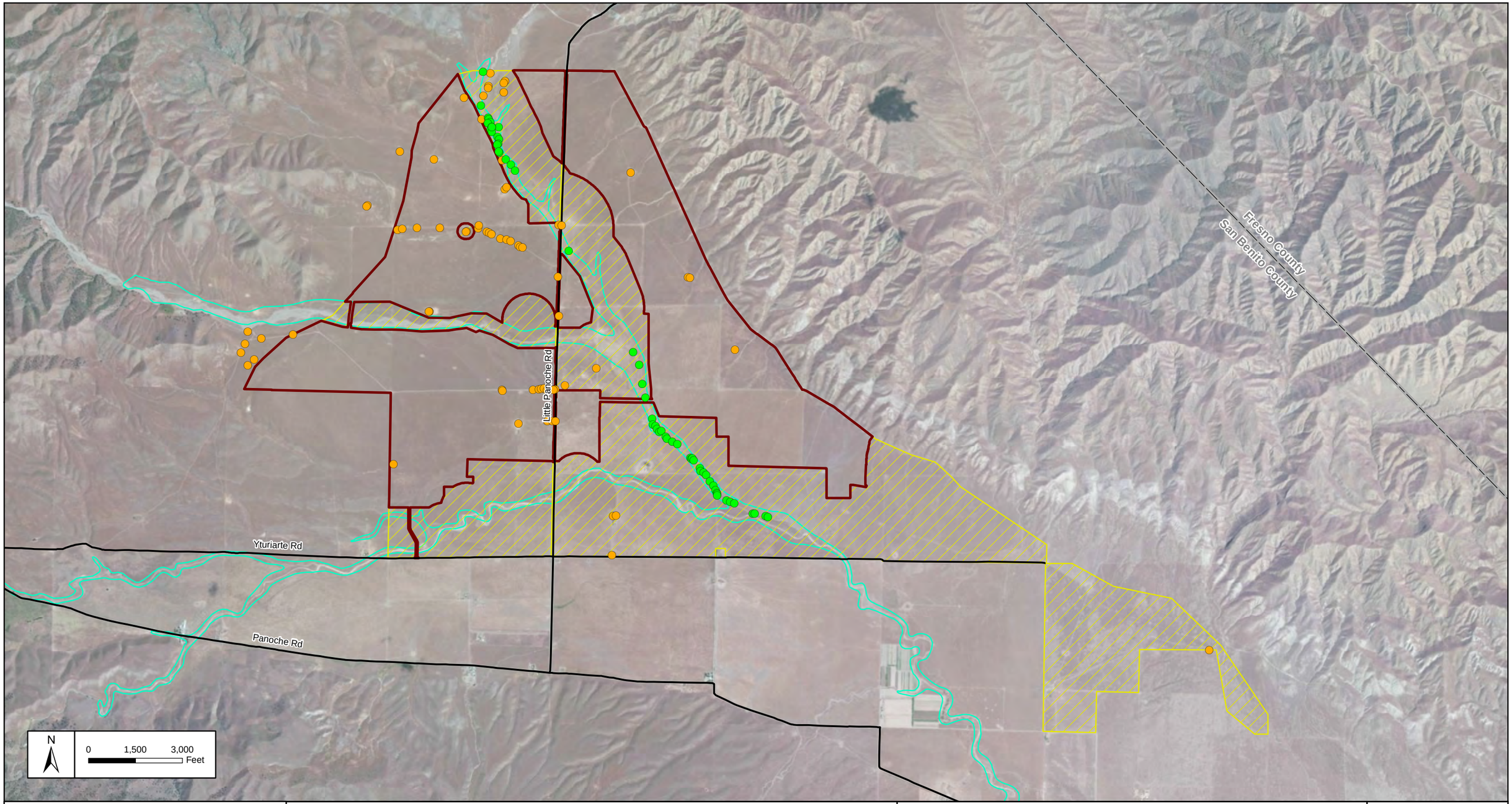
Panoche Valley Solar Project

2013 San Joaquin Antelope Squirrel Observation

FIGURE

14

JH 2015-05-31



305 Camp Craft Road, Suite 575
West Lake Hills, Texas 78746
512-222-1125
www.energyrenewalpartners.com
Energy Renewal
PARTNERS, LLC

Legend

- Project Footprint
- Valley Floor Conservation Lands
- Vernal Pool within 100-Year Floodplain (56)
- Vernal Pool outside 100-Year Floodplain (71)
- 100-Year Floodplain

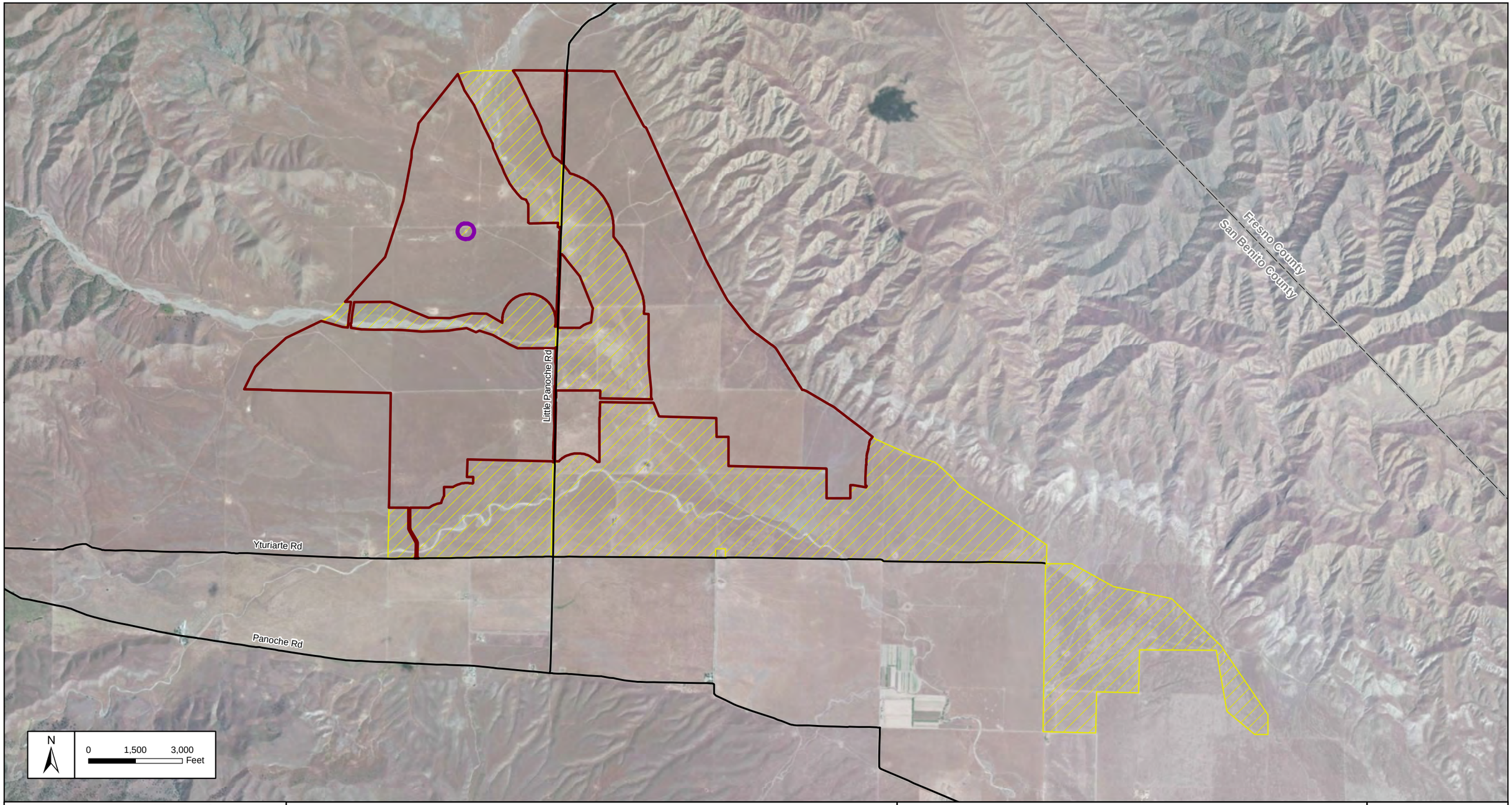
Panoche Valley Solar Project

Ephemeral Pool Habitat Locations

FIGURE

15

JH 2015-05-31



305 Camp Craft Road, Suite 575
West Lake Hills, Texas 78746
512-222-1125
www.energyrenewalpartners.com
Energy Renewal
PARTNERS, LLC

Legend

- Project Footprint
- Valley Floor Conservation Lands
- Vernal Pool Fairy Shrimp Observations

Panoche Valley Solar Project

Vernal Pool Fairy Shrimp Observations

FIGURE

16

JH 2015-05-31

Appendix E – WMMP

See H.16 in Appendix H of the FEIS

Appendix F – GKR Relocation Plan

See H.5 in Appendix H of the FEIS

Appendix G – CTS Pond Creation Proposal

July 20, 2012

PANOCHE VALLEY SOLAR, LLC

Panoche Valley Solar Farm

California Tiger Salamander Mitigation Pond Proposal

PROJECT NUMBER:
127165

PROJECT CONTACT:
Ben Bainbridge
EMAIL:
ben.bainbridge@powereng.com
PHONE:
208-788-0391

POWER ENGINEERS

California Tiger Salamander Mitigation Pond Proposal

PREPARED FOR: PANOCHE VALLEY SOLAR, LLC

PREPARED BY: BEN BAINBRIDGE

TABLE OF CONTENTS

FIGURES:

APPENDICES:

ACRONYMS AND ABBREVIATIONS

AC	alternating current
BLM	Bureau of Land Management
cm	centimeters
CNDDB	California Natural Diversity Database
Control Plan	Noxious Weed and Invasive Plant Control Plan
CTS	California tiger salamander
DC	Direct Current
ºF	degrees Fahrenheit
FEIR	Final Environmental Impact Report
kV	kilovolt
LOA	Live Oak Associates
MW	megawatts
NRCS	National Resource Conservation Service
O&M	operations and maintenance
PG&E	Pacific Gas & Electric
POWER	POWER Engineers, Inc.
Proposed Project	Panoche Valley Solar Farm Proposed Project
PV	photovoltaic
USFWS	United States Fish and Wildlife Service

1.0 PROJECT DESCRIPTION

Panoche Valley Solar, LLC proposes to construct and operate the Panoche Valley Solar Farm (Proposed Project), a 399 megawatt (MW) solar photovoltaic energy generating facility. Because the Proposed Project will be placed adjacent to occupied California tiger salamander (CTS; *Ambystoma californiense*) breeding ponds, and will impact other potential, unoccupied breeding ponds, Panoche Valley Solar, LLC will construct new additional breeding ponds located outside of the footprint of the Proposed Project. This document presents three potential locations for new breeding ponds located on conservation lands associated with the Proposed Project. Two potential locations occur on the Valadeao Ranch Conservation Lands in close proximity to a known CTS breeding pond. One potential location occurs on Silver Creek Ranch Conservation Lands in close proximity to other existing potential CTS breeding ponds.

The Proposed Project site comprises approximately 4,885 acres in the Panoche Valley of eastern San Benito County, CA. The Proposed Project will be constructed in five phases with the first phase being 20 MW, and each subsequent phase consisting of approximately 100 MW each. The Proposed Project would be located on heavily grazed rangeland and would generally include development of the following components on 2,203 of the 4,885 acres (approximately 50% of site):

- Installation of approximately three to four million photovoltaic (PV) panels
- PV module steel support structures
- Electrical inverters and transformers
- An electrical substation with switchyard
- Buried electrical collection conduit
- An operations and maintenance (O&M) building
- A septic system and leach field
- Wastewater treatment facility/demineralization pond
- On-site access roads
- Security fencing
- Transmission support towers and line(s) to interconnect with a Pacific Gas & Electric (PG&E) transmission line that passes through the Project site

The Proposed Project would be installed over an area of approximately 4,885 acres (7.6 square miles). However, the proposed design confines the solar arrays, substation (including the O&M building and transmission interconnection towers), and on-site access roads to a footprint of approximately 2,203 acres. The remaining approximately 2,682 acres within the Project boundary would be left undisturbed. Interstitial space between rows of panels, access roads, and O&M facilities would incorporate approximately 610 acres. Undisturbed areas would include on-site drainages and riparian buffer zones totaling 389 acres, as well as approximately 1,683 acres of open space in the southern portion of the Project Area. These undisturbed areas would remain as open space, and would be managed as on-site conservation areas to maintain and enhance habitat conditions for listed species. On-site conservation areas would incorporate approximately 2,072 acres.

Project construction would occur in five phases over a total of approximately five years, at one year per phase. Approximately 18 percent of the site would be temporarily disturbed at any one time during construction and would be restored in accordance with a revegetation plan. Revegetation will be conducted on areas temporarily disturbed during construction to restore vegetative cover to similar pre-construction condition or, if requested, to meet other reasonable landowner requests, once site

work is completed. Disturbed areas will be reclaimed by appropriate contouring, where appropriate, and replanting with an approved seed mix. All seed mixtures will be certified "weed free." Noxious weeds will be controlled through implementation of the Noxious Weed and Invasive Plant Control Plan (Control Plan). Within the Control Plan, herbicides will be used in accordance with the Bureau of Land Management (BLM) Approved Adjuvant and will follow federal and state regulations.

In general, each PV panel will be approximately two by four feet; however as technology changes during the life of the Project, larger panels may be used. All panels will be oriented toward the south and southwest, and angled upward at a degree that would maximize solar resource efficiency. Panel faces will be non-reflective and black or blue in color. The normal operating temperature of the PV panel face would be 10-15 degrees Fahrenheit (°F) above ambient temperature, and a typical summer day at 82°F would result in panel face temperatures of approximately 100°F. Panels will result in shading of the area below, providing a cooling effect beneath each structure. The PV solar panels will be mounted on direct-driven steel support structures that are between four and 25 feet in height. The steel support structures will be constructed of corrosion-resistant and galvanized steel. Concrete foundations will not be required for PV panel mounts.

The direct electrical current (DC) generated by the panels will be converted to alternating current (AC) by individual inverters, stepped up by transformers, and transmitted to a new substation via 34.5 kilovolt (kV) (AC) medium-voltage collection lines. The medium voltage collection lines will begin at the inverter transformers and will be located in trenches until the output from between 10 and 15 power blocks is terminated in the collection breaker of the substation. The electrical substation will convert power from 34.5 to 230 kV. The substation will be located directly adjacent to the existing PG&E transmission line.

The main access road, which will be a 24-foot-wide gravel road with a gate, will enter the site from the east or west from Little Panoche Road. The interior access roads will be 12-foot-wide gravel roads. Main site access roads will be graded and compacted using existing soil with a cover of gravel. Maintenance roads will be graded and compacted using existing soil with no gravel. Access roads will cross the onsite washes during construction and operation of the Proposed Project to provide adequate ingress and egress to and from the Project site for vehicles in the event of an emergency.

A six-foot-high smooth-top chain link fence will be placed around the blocks of panels. Fencing around the blocks of panels will be 5.5 feet of chain link with a 24 inch gap from ground surface to fence bottom to allow for wildlife movement.

Panel assembly will occur on-site. Panel components, such as the PV panels and racks, will be transported to laydown areas, where steel rack assemblies will be constructed at each block, and PV panels will be lowered onto the racks with final fastening being performed at the block. All items will be transported by container truck. A pre-fabricated racking system will arrive on site at a rate of approximately 10 to 20 MW per month to be assembled and grounded at the site. Pre-assembled PV panels will arrive on site and be placed in a staging area inside shipping containers. Panels will be put in place manually and secured to the rack per vendor specifications. The rack will be populated with panels, wired in series, and connected to a DC combiner box, which will deliver DC power to the local inverters.

1.1 Proposed Mitigation

The following identifies mitigation measures described in the Proposed Project Biological Assessment (10/26/2010) and associated Addendum (9/16/2011), and the Final Environmental Impact Report (FEIR; 9/30/2010) which the Proposed Project will utilize with the specific aim of reducing impacts to CTS:

- Project components were designed to avoid impacts to known CTS breeding ponds.
- All activities that will result in permanent or temporary ground disturbance shall be preceded by a preconstruction survey conducted by a qualified biologist. If CTS are observed during burrow excavation or during construction activities, all work will be suspended within the immediate area until such time a designated biologist with appropriate federal and state permits to handle CTS moves the individual.
- Suitable rodent burrows occurring within 0.4 mile of the four breeding ponds where CTS could reasonably be expected to aestivate, will be excavated if Project construction is to occur within 25 feet of a suitable burrow.
- CTS found during preconstruction surveys will be relocated to suitable small mammal burrows on areas of the Project site which will remain undisturbed.
- As required by the FEIR, breeding habitats and suitable upland habitat disturbed within 2,100 feet of a known or potential breeding pond will be mitigated at a 3:1 acreage ratio; suitable upland habitat located between 2,100 feet and 2,640 feet (0.5 mile) of a breeding pond will be mitigated at a 2:1 acreage ratio; and suitable upland habitat located between 2,640 feet and 6,636 feet (1.2 miles) of a breeding pond will be mitigated at a 1:1 acreage ratio. Temporary impacts will be mitigated at a 0.5:1 acreage ratio. Preserved habitat shall be the same quality or better quality than the habitat disturbed.
- Additional suitable breeding ponds within suitable aestivation habitat will be created on off-site conservation lands to mitigate the loss of potential breeding ponds on the Project Area.

One component of proposed mitigation which will have a positive effect on most species found in the vicinity of the Project Area is the permanent preservation, enhancement and management of approximately 21,000 acres of land directly adjacent to the Project Area. These 21,000 acres of off-site conservation lands are broken up into two areas. To the north, northeast and west of the Project Area is approximately 10,000 acres formerly known as the Valadeao Ranch. The Valadeao Ranch is a combination of rough, rugged hills and a portion of the Little Panoche Valley. The Little Panoche Valley is a lightly sloping valley with native grasses, and provides occupied habitat for San Joaquin kit fox, giant kangaroo rat, American badger, golden eagle, mountain plover, and burrowing owl.

To the southeast of the Project Area is approximately 11,000 acres formerly known as Silver Creek Ranch. Silver Creek Ranch is less sloped and rugged than the Valadeao Ranch, and is predominantly situated within the Panoche Valley. Full surveys have yet to be performed on Silver Creek Ranch, but previously documented surveys indicate it provides suitable habitat for blunt-nosed leopard lizard, golden eagle, mountain plover, burrowing owl, San Joaquin antelope squirrel, giant kangaroo rat, San Joaquin kit fox, and American badger. The key value of Silver Creek Ranch as conservation lands is that it is within the same valley and largely the same habitat type as the Project Area. The Recovery Plan for Upland Species of the San Joaquin Valley, California (USFWS 1998) specifically identified the natural lands in association with Silver Creek Ranch as areas of priority for habitat protection to conserve occupied habitat for Panoche Valley populations of blunt-nosed leopard lizard and giant kangaroo rat (USFWS 1998: pp 95 and 122).

Monitoring of conservation lands will permit an adaptive management program, such as modification of grazing regime to favor species on site. These off-site lands will be managed by a third party such as the BLM or California Rangeland Trust.

In addition to the off-site conservation lands, the Proposed Project will incorporate approximately 2,000 acres of on-site conservation lands, referred to as Valley Floor Conservation Lands. These lands include the southern portion of the Project Area and the major washes purposely avoided by the Project design. The southern portion of the Project Area which will be included in the on-site conservation lands, incorporates all of the blunt-nosed leopard lizard sightings to date on the Project Area; the majority of high-suitability giant kangaroo rat habitat; a large majority of the San Joaquin kit fox sightings; and evidence found by scat-sniffing dogs.

When Valley Floor, Valadeao Ranch, and Silver Creek Ranch Conservation Lands are combined, the Proposed Project would permanently conserve over 23,000 acres of potential habitat for botanical and wildlife species. These lands would go toward meeting mitigation ratio criteria for special status species which would be impacted by the Proposed Project.

On June 28, 2012, a site visit to the Proposed Project site, Valadeao Ranch Conservation Lands, and Silver Creek Ranch Conservation Lands was completed to identify potential locations to create CTS breeding ponds to comply with the final mitigation bullet point listed above. Attendees at this site visit included biologists from POWER Engineers, Inc. (POWER) and Live Oak Associates (LOA), and one hydrologist from WH Pacific to identify potential locations in the field. The site visit on the Valadeao Ranch Conservation Lands focused on the lower slopes and flatter landscape surrounding the known CTS breeding pond to the west of the Proposed Project. By placing a potential breeding pond within close proximity to the known breeding pond, the Proposed Project would create a breeding pond complex to better serve the species. The site visit to the Silver Creek Ranch Conservation Lands focused on the lower slopes and flatter landscape to the north of Panoche Creek. Results of this site visit are described in Section 3.0 below.

2.0 EXISTING CONDITIONS

2.1 CTS Species Ecology

The CTS originally inhabited most of central California, and remains in remnant populations throughout much of its original range. California Natural Diversity Database (CNDDB) records for CTS show its distribution encompasses portions on Alameda, Amador, Calaveras, Contra Costa, Fresno, Kern, Kings, Madera, Mariposa, Merced, Monterey, Sacramento, San Benito, San Joaquin, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Solano, Sonoma, Stanislaus, Tulare, Tuolumne, and Yolo Counties (NatureServe 2009). About 80% of all extant occurrences are in Alameda, Contra Costa, Madera, Merced, Monterey, San Benito, and Santa Clara counties, with 30% of all occurrences in Alameda County (NatureServe 2009). The use of vernal pools and other temporary bodies of water for breeding limits the CTS to areas of low elevation and low topographic relief throughout their range (Stokes et al. 2008). Ephemeral vernal pools which refill with water on a yearly basis, are 40 to 80 centimeters (cm) in depth, and have a surface area of 0.2 hectare (0.5 acre) or more are optimal for breeding CTS, although small, shallower pools will also house breeding CTS (Stokes et al. 2008). Depth of the breeding pool was highly correlated with breeding CTS. Stokes et al. (2008) found no CTS larvae in pools with an average depth of less than 22 cm. Deep pools with permanent water may not be optimal for breeding populations of CTS because they often house predatory fish, crayfish, or bullfrogs that prey upon larval CTS. This creates a narrow window of pool depth where the pool will not completely dry out before CTS have metamorphosed, but also will not contain water year round and house predators. Metamorphosed CTS move out of the vernal pools and into upland habitats. Small mammal burrows are important features of upland habitat. Adult CTS occupy small mammal burrows in grassland, savanna, or open woodland habitats (Trenham and Shaffer 2005).

Activity patterns of adult CTS are not well understood. Adult CTS live their entire lives in the burrows of small mammals such as the California ground squirrel. Adults begin moving toward breeding pools when the first fall rains begin to inundate pools. Breeding adults will continue moving to pools through the winter and spring. Adults can generally be found at breeding pools from October through May, although breeding is highly dependent on the amount of precipitation (Trenham et al. 2001; Trenham and Shaffer 2005). Adult CTS leave the breeding pools in late spring and return to upland habitats. Trenham and Shaffer (2005) used pitfall traps at various intervals away from a pool to determine the extent of upland use. They found that the numbers of adult CTS declined as distance from the pool increased out to 620 meters. Subadults also moved up to 600 meters away from the pools, but most were concentrated between 200 and 600 meters from the pool. This has led managers to suggest preserving upland habitats with suitable small mammal burrows out to 600 meters from breeding pools (Trenham and Shaffer 2005).

CTS may take upward of four to five years to reach sexual maturity (Trenham et al. 2000). Although individuals can live upward of ten years, less than 50% of individuals breed more than once (Trenham et al. 2000). Rainfall can significantly alter adult breeding pool attendance, and production of metamorphs tends to be a boom-or-bust scenario. Typically, greater numbers of breeding adults return to pools during years with greater rainfall (Trenham et al. 2000, 2001; Cook et al. 2006; Stokes et al. 2008). Males are often the first to arrive at breeding pools and remain in the pool longer than females (Trenham et al. 2000). Larvae remain in the pools approximately four months and emigrate from the pools as they dry. Metamorph emigration typically occurs throughout May and is directly related to the pool drying date (Trenham et al. 2000).

Often amphibian populations are used as an example for the metapopulation/source-sink models. The CTS populations at different breeding pools often act in a metapopulation fashion (Trenham et al. 2001). Mark – recapture studies found that while most breeding adults return to their natal pool, 22% dispersed to different ponds (Trenham et al. 2001). It should be noted that Trenham and Shaffer (2005) did not capture any CTS, adult or subadult, more than 620 meters from the pool. Thus, pools more than 1,240 meters from one another may limit dispersal. Breeding CTS have been known to use artificially created pools, and the creation of pools in a stepping-stone fashion has been suggested to aid dispersal between populations (Stokes et al. 2008).

2.2 Surveys Completed

In the winter of 2009 – 2010 biologists from LOA completed Protocol Vernal Pool Branchiopod Surveys in support of the Proposed Project. These vernal pool branchiopod surveys identified larval CTS while surveying other species. Protocol CTS Larval Surveys, performed in March, April and May of 2010, also noted larval CTS. Results of these two surveys identified larval CTS in two ponds. Both ponds were located off the Proposed Project. One pond is in Township 15S, Range 10E, Section 4 just outside the boundary of the Project site. This pond will be referred to as Pond 12 and is further described in Section 2.2.3 below. The second pond is located off-site in Township 15S, Range 10E, Section 17. Additionally, the CNDDB contains historical records of CTS breeding ponds located in the Las Aguillas Creek drainage within the Proposed Project. These historical breeding ponds occur on the Valley Floor Conservation Lands and will not be impacted by the Proposed Project.

It is unknown at this time to what extent the Silver Creek Ranch conservation lands support CTS. Full protocol surveys have not yet taken place on Silver Creek Ranch; however LOA herpetological experts expect several ephemeral ponds on site to be utilized by breeding CTS.

2.2.1 Pond 12

Pond 12 is a man-made pond which contains water behind a push-up dam for the purpose of providing water to cattle on the Valadeao Ranch conservation lands (Figure 1). Area calculations performed using aerial imagery determined that the maximum surface area of water capable of being retained behind the push-up dam is approximately 0.2 acre. During surveys performed for CTS larvae in Pond 12 during the winter and spring of 2010, the maximum surface area of the water was approximately 0.1 acre. Maximum depth recorded during these same surveys was 57 cm (22 inches).

The watershed area for the Pond 12 is approximately 0.63 square mile. The contributing watershed feeds to an incised channel which dissipates when it reaches the low gradient valley floor. After reaching the valley floor, the flow becomes sheet or shallow concentrated flow before reaching Pond 12. Pond 12 was constructed by excavating out the pond and using the cut material to build a berm on the downslope side. The berm is of unknown height, but is assumed to be approximately four feet.

Pond 12 survey data from LOA's CTS surveys in late 2009/early 2010 were analyzed with actual monthly precipitation data from the same period (Appendix A). WH Pacific created a water budget model for potential mitigation ponds using the aforementioned data along with mean monthly evaporation rates, and adjusted the assumed infiltration rate and assumed fraction of rainfall that will reach the pond as runoff to find the best match of the model to known data. The results of this analysis showed that the pond was both filling and emptying much slower than expected, indicating slower infiltration in the pond and a small fraction of rainfall reclaimed as runoff. The infiltration rate, which coupled with mean evaporation rate, created slower than expected emptying of the pond –

approximately 2.5% of the published Natural Resource Conservation Service (NRCS) rate for the soil in the area. The assumed fraction of rainfall that is collected as runoff was approximately 0.2%. The reason for this is likely due to two reasons. The first is that the runoff originates of the hills in a concentrated flow in an incised channel. When it hits the valley floor, the flow goes to sheet flow for approximately 1,000 feet where it can be lost to infiltration and evapo-transpiration before reaching the pond. The second potential reason for the low fraction of rainfall collected is caused by the potential direction of the sheet flow. From examination of vegetation patterns on aerial imagery, it appears as though half of the sheet flow may bypass the pond.

3.0 PROPOSED MITIGATION PONDS

The following goals were placed on potential mitigation pond locations during the water budget analysis:

- Mitigation ponds will be ephemeral, filling in late fall, winter, and spring, and drying out by early June. Critical months of inundation are March – May.
- Mitigation ponds will be approximately three feet deep.
- Mitigation ponds ideal footprint will be equal to that of Pond 12.
- Mitigation ponds are desired to be inundated five out of every ten years, with a minimum of three out of every ten years.

The following sources of data were used to develop water budget parameters for potential mitigation pond locations:

- Pan evaporation rates were obtained for the Little Panoche Detention Dam, 1963 – 1975, from *NOAA Technical Report NWS 34, Mean Monthly, Seasonal, and Annual Pan Evaporation for the United States*.
- Rainfall data was obtained for the Panoche 2W Weather Station from the Western Regional Climate Center website, December of 1949 through April 2012.
- Soil hydrological ratings and infiltration rates were obtained from the NRCS Web Soil Survey website.
- Observations of existing pond depth and surface area obtained from LOA's 2010 CTS survey data.

The water budget analysis utilized to determine the depth, surface area, and inundation period of potential mitigation ponds was based over a year-long timeframe with one month increments using median precipitation values for each month. NRCS Soil Survey data was obtained to determine average exfiltration rates of the various soil types in the areas of pond construction. These soil types showed extremely quick draining soils which would present difficulties in keeping a mitigation pond saturated for the appropriate duration. The Pond 12 depth/surface area ratio was used to make an estimate of infiltration. The pool demonstrated infiltration rates approximately 2.5% of the published NRCS soil data. This is a common scenario in ephemeral ponds where fine silts and clays washed in over time reduces the infiltration rate.

The runoff coefficient described in Panoche Valley Hydrological Study, SolarGen Panoche Valley Solar Farm, Panoche Valley, California prepared by Geologica in mid-2010 was 0.55. This means that approximately 55% of rainfall in the Panoche Valley can be expected to runoff. A HydroCAD analysis performed by WH Pacific showed that this is a reasonable assumption during a large, 100-year type of rainfall event; however, approximately 25% can be expected as runoff during smaller 1-year rainfall events and 15% for six month events. The data for Pond 12 demonstrated a very low runoff capture rate, capturing an estimated 0.2% of the total precipitation for the watershed. Runoff in the Pond 12 watershed progresses from an incised channel at higher, steeper elevations, to a shallow, spread-out sheet flow where much of the water is lost prior to entering the pool. For the purposes of this analysis, it was assumed that 5% of the monthly rainfall can be retained if the mitigation pond is placed near the outlet of an incised channel, and 0.2% when the pond is located far from the incised channel.

Six potential mitigation pond locations were marked during the June 28 site visit. After a preliminary water budget analysis, three potential pond locations were carried forward for a more detailed analysis described below. Sections 3.1 through 3.3 below describe the potential breeding pond locations: two on Valadeao Ranch, one on Silver Creek Ranch. These potential ponds are Valadeao Pond Site 3, Valadeao Pond Site 4, and Silver Creek Pond Site 1. As per the mitigation measures described in the Biological Assessment and associated Addendum, and the FEIR, the Proposed Project proposes to construct one mitigation pond on the Valadeao Ranch in close proximity to Pond 12, and one mitigation pond on the Silver Creek Ranch at a later date depending on the results of future CTS surveys on that property. The mitigation ponds may require the construction of shallow diversion canals perpendicular to the slope to capture sheet flow and direct it to the ponds to ensure that the ponds will remain inundated for a sufficient length of time. Exfiltration rates are the ruling factor in sizing the ponds, as these are many times higher than the evaporation rates during winter and spring. To reduce the amount of exfiltration, the rate of the in-situ native soil could be reduced by amending the native soil with a less permeable material such as bentonite or clay.

3.1 Valadeao Ranch Pond Site 3

Valadeao Ranch Pond Site 3 is located at approximately 2,300 feet (720 meters) west-northwest of Pond 12 at Easting 0687567, Northing 4058555 (UTM Zone 10; Figure 1). Valadeao Ranch Pond Site 3 is located near where an incised channel ends and the runoff converts to sheet flow. Based on this location, the pond would expect to collect a higher percentage of the monthly rainfall as runoff. For purposes of the analysis, it was assumed that the pond would capture 5% of the runoff. Valadeao Ranch Pond Site 3 has a drainage area of approximately 0.44 square mile. This area is 70% of the area of Pond 12; therefore, a pond surface area that is 70% of the existing pond surface area, or 0.14 acre would initially be anticipated. However, since we anticipate a higher rainfall as runoff capture ratio for this location, we ran the water budget model using the same size of pond as Pond 12. The water budget analysis shows Valadeao Ranch Pond Site 3 will fill to 0.14 acre, and a bypass spillway would be required to pass water over the dam. Appendix A provides the water budget analysis performed for Valadeao Ranch Pond Site 3.

From examination of aerial imagery, it appears that nearly all the sheet flow coming from the contributing area for Valadeao Ranch Pond Site 3 bypasses the existing breeding pond established in Pond 12, and therefore installation of a mitigation pond at this location would not detrimentally affect Pond 12. Additionally, the model shows that Valadeao Ranch Pond Site 3 will have excess water, assuming the 5% capture rate is correct, and provisions can be made to focus spillway discharge water toward the existing pond.

The NRCS mapping indicates that Valadeao Ranch Pond Site 3 is located in Yolo Gravelly Loam, and has a hydraulic conductivity rating of 12.0 micrometers per second, or 1.7 inches per hour. For purposes of the modeling, 2.5% of the NRCS rate was utilized, which is 0.0425 inch per hour. This was based on the infiltration rate demonstrated by Pond 12.

3.2 Valadeao Ranch Pond Site 4

Valadeao Ranch Pond Site 4 is located approximately 2,000 feet (630 meters) south-southwest of Pond 12 at Easting 0687975, Northing 4057754 (UTM Zone 10; Figure 1). Valadeao Ranch Pond Site 4 is located approximately 1,000 feet down slope of where an incised channel transitions to sheet flow. Therefore, the water budget analysis used the same capture rate as Pond 12 (0.2%). Because the

drainage area of Valadeao Ranch Pond Site 4 is approximately half that of Pond 12, it was assumed that the drainage would support a pond of approximately 0.1 acre. The water budget analysis found that the drainage would support a pond of approximately 0.1 acre, with a maximum depth of just over one foot occurring in February. Appendix A provides the water budget analysis performed for Valadeao Ranch Pond Site 4.

A potential design component of Valadeao Ranch Pond Site 4 could include extending the incised channel to the pond location in order to retain water potentially lost as sheet flow, while still capturing sheet flow from surrounding hills which does not accumulate in an incised channel. Another potential design component of Valadeao Ranch Pond Site 4 could include creating diversion dams perpendicular to the direction of sheet flow to better direct flow to the pond location.

Currently, a stock watering trough which is filled by gravity fed piped spring water is located near Valadeao Ranch Pond Site 4. This piped spring water could potentially be used to augment natural runoff collected in the pond during the winter and spring. The piped water could be diverted back to the water trough to ensure that the mitigation pond would dry out in late spring or early summer.

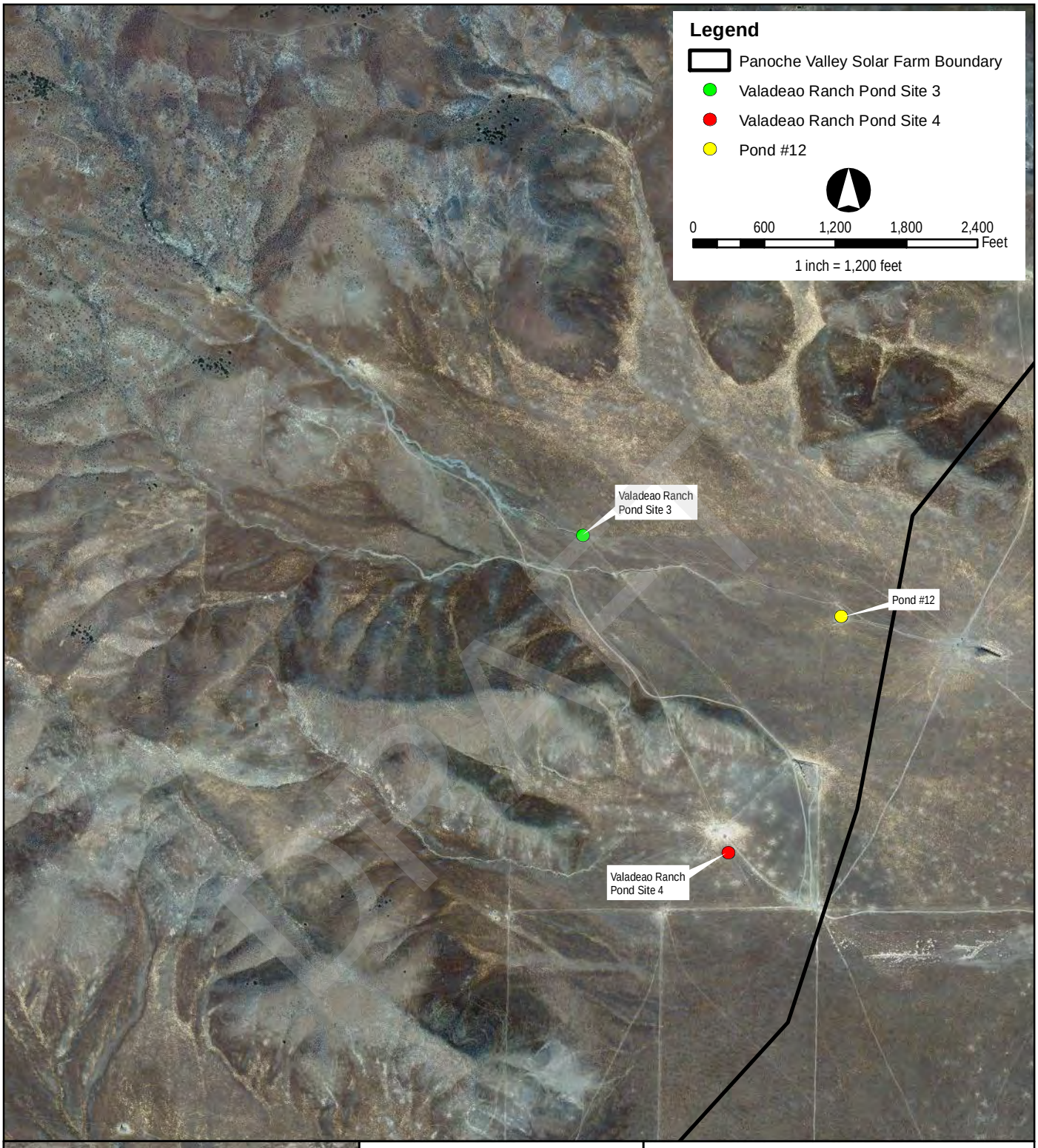
The NRCS mapping indicates that Valadeao Ranch Pond Site 4 is located in Yolo Gravelly Loam, and has a hydraulic conductivity rating of 12.0 micrometers per second, or 1.7 inches per hour. For purposes of the modeling, 2.5% of the NRCS rate was utilized, which is 0.0425 inch per hour. This was based on the infiltration rate demonstrated by Pond 12.

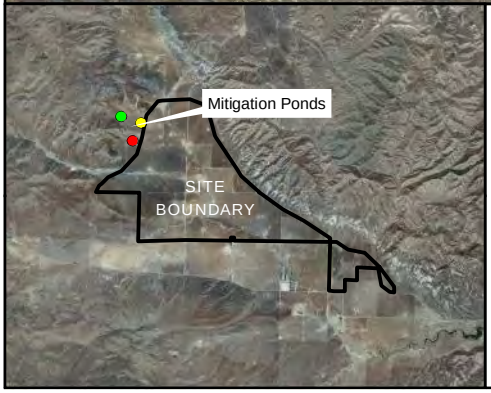
3.3 Silver Creek Pond Site 1

Silver Creek Pond Site 1 is located at the bottom of an incised drainage at Easting 0698859, Northing 4050925 (UTM Zone 10; Figure 2). Based on the June 28, 2012 site visit, Silver Creek Pond Site 1 was identified as a favorable location for a CTS mitigation pond due to the character of the incoming drainage. The drainage basin for Silver Creek Pond Site 1 encompasses approximately 0.2 square mile. Based on the June 28, 2012 site visit, the channel is fully vegetated and is not as deeply incised as those on the Valadeao Ranch. Silver Creek Pond Site 1 is located near the outlet of the vegetated channel; however, due to the unknowns of the watershed characteristics, a conservative rainfall as runoff capture rate of 0.5% was used in the water budget analysis. This runoff capture rate is just over twice the value of Pond 12. The use of a 0.5% runoff capture rate is based on the fact that there will be very little flow which will bypass the pond, and is conservative considering that the pond will be located closer to a concentrating channel.

The water budget for Silver Creek Pond Site 1 was initially modeled using a footprint of 0.06 acre, or 32% of existing Pond 12. The water budget analysis for a pond of 0.06 acre at Silver Creek Pond Site 1 showed that the pond would go dry in June and have maximum depth of approximately two feet in February. Appendix A provides the water budget analysis performed for Silver Creek Pond Site 1.

The NRCS mapping indicates that Silver Creek Ranch Pond Site 1 is located in Panoche Sandy Loam, and has a hydraulic conductivity rating of 12.3109 micrometers per second, or 1.74 inches per hour. For purposes of the modeling, 2.5% of the NRCS rate was utilized, which is 0.0425 inch per hour. This was based on the infiltration rate demonstrated by Pond 12.





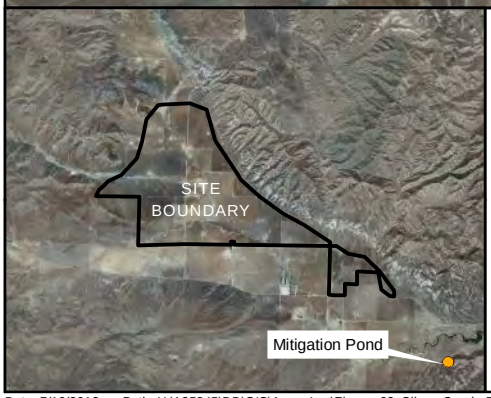
Panoche Valley Solar Farm

Figure 1
Valadeao Ranch Mitigation Ponds

POWER ENGINEERS

Duke Energy Renewables

Date: 7/26/2012 Path: H:\125845\DD\GIS\Apps_Lax\Figure_01_Valadeao_Ranch_Mitigation_Ponds.mxd



Panoche Valley Solar Farm

Figure 2
Silver Creek Pond Site 1

POWER ENGINEERS

Duke Energy Renewables

Date: 7/19/2012 Path: H:\125845\DD\GIS\Apps_Lax\Figure_02_Silver_Creek_Pond_Site_1.mxd

4.0 CONCLUSIONS

The Proposed Project proposes to construct one mitigation pond on the Valadeao Ranch in close proximity to Pond 12, and one mitigation pond on the Silver Creek Ranch at a later date depending on the results of future CTS surveys on that property. This is consistent with mitigation measures described in the Biological Assessment and associated Addendum, and the FEIR prepared on behalf of the Proposed Project. By creating a new potential CTS breeding pond in close proximity to the existing breeding pond at Pond 12, the Proposed Project will create a breeding pond complex which may support increased genetic diversity and will provide multiple breeding pond options (Trenham et al. 2001; Trenham and Shaffer 2005). Which Valadeao Ranch pond location would best conserve CTS populations in and around the Proposed Project will be determined through consultation with the U.S. Fish and Wildlife Service and the California Department of Fish and Game.

5.0 LITERATURE CITED

Cook, D.G., P.C. Trenham, and P.T. Northen. 2006. Demography and breeding phenology of the California tiger salamander (*Ambystoma californiense*) in an urban landscape. Northwestern Naturalist. 87:215-224.

NatureServe. 2009. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://www.natureserve.org/explorer. (Accessed: March 2, 2010).

Stokes, D., D.G. Cook, and P.C. Trenham. 2008. Sonoma California Tiger Salamander Population Ecology and Preserve Management: an Eight Year Study. *Prepared for* U.S. Fish and Wildlife Service. Sacramento, CA. Pp 34.

Trenham, P.C., H.B. Shaffer, W.D. Koenig, and M.R. Stromberg. 2000. Life history and demographic variation in the California tiger salamander (*Ambystoma californiense*). Copeia. 2:365-377.

Trenham, P.C., W.D. Koenig, and H.B. Shaffer. 2001. Spatially autocorrelated demography and interpond dispersal in the salamander *Ambystoma californiense*. Ecology. 82:3519-3530.

Trenham, P.C., and H.B. Shaffer. 2005. Amphibian upland habitat use and its consequences for population viability. Ecological Applications. 15:1158-1168.

U.S. Fish and Wildlife Service (USFWS). 1998. Recovery Plan for Upland Species of the San Joaquin Valley, California.

APPENDIX A MITIGATION POND AND POND 12 WATER BUDGET ANALYSIS

	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Mean Monthly Precipitation[1], in	2.00	1.93	1.50	0.67	0.30	0.06	0.02	0.03	0.25	0.50	1.01	1.58	9.85
Median Monthly Precipitation[2], in	1.65	1.59	1.06	0.53	0.14	0.00	0.00	0.00	0.01	0.29	0.75	1.20	9.00
Average Monthly Pan Evaporation[3], in	1.77	2.87	5.79	8.62	13.66	15.83	17.09	15.65	11.65	7.09	2.95	1.81	104.78

[1]Data for Panoche 2W Weather Station (046675) from 1949-2012, Western Regional Climate Center

[1]Data for Panoche 2W Weather Station (046675) from 1949-2012, Western Regional Climate Center, Median value calculated by WHPacific

[2]Data for Little Panoche Detention Dam, 1963-1975, from NOAA Technical Report NWS 34, Mean Monthly, Seasonal, and Annual Pan Evaporation for the United States

Projected Monthly Water Budgets

Valadeo Ranch

Pond #12 (existing)

Watershed Area= 0.63 mi^2

= 403.2 acres

Assumed fraction of rainfall that will reach pond[4]= 0.00273

Pond soil NRCS unit symbol= YvB

NRCS saturated infiltration rate= 1.7 in/hr

Projected pond infiltration rate= 0.0425 in/hr

Full Surface Area= 0.2 acres = 0.081 Ha

Full Depth Estimate= 3.92 ft

Full Vol Estimate= 0.392 ac-ft

Area x coeff= 0.051

Volume x^2 coeff= 0.0255

[4]Runoff going to existing pond travels as overland sheet flow approximately 1000LF prior to reaching the pond and it is assume it loses quite a bit of volume in order to match the model with observed results.

Month	Runoff Volume (ac-ft)	Pan Evaporation Volume (ac-ft)	Exfiltration Volume (ac-ft)	Cumulative stored volume (ac-ft)	Estimated Stage (ft)	Estimated Surface Area at Stage (ac)	Volume at stage	Solver
September	0.001	0.000	0.001	0.000	0.01	0.000	0.0000	0.0000
October	0.027	0.005	0.021	0.001	0.16	0.008	0.0006	0.0000
November	0.069	0.006	0.059	0.005	0.45	0.023	0.0052	0.0000
December	0.110	0.006	0.097	0.013	0.72	0.037	0.0132	0.0000
January	0.151	0.007	0.132	0.025	0.98	0.050	0.0247	0.0000
February	0.146	0.013	0.129	0.029	1.06	0.054	0.0288	0.0000
March	0.097	0.018	0.096	0.013	0.71	0.036	0.0129	0.0000
April	0.049	0.013	0.046	0.003	0.35	0.018	0.0031	0.0000
May	0.012	0.005	0.011	0.000	0.08	0.004	0.0002	0.0000
June	0.000	0.000	0.001	0.000	0.01	0.000	0.0000	0.0000
July	0.000	0.000	0.000	0.000	0.00	0.000	0.0000	0.0000
August	0.000	0.000	0.000	0.000	0.00	0.000	0.0000	0.0000

Valadeo Site 3

Watershed Area= 0.44 mi^2

= 281.6 acres

Assumed fraction of rainfall that will reach pond[5]= 0.05

Pond soil NRCS unit symbol= YvB

NRCS saturated infiltration rate= 1.7 in/hr

Projected pond infiltration rate= 0.0425 in/hr

Full Surface Area= 0.2 acres = 0.081 Ha

Full Depth Estimate= 3.92 ft

Full Vol Estimate= 0.392 ac-ft

Area x coeff= 0.051

Volume x^2 coeff= 0.0255

[5]Runoff coefficient described in Panoche Valley Hydrological Study, SolarGen Panoche Valley Solar Farm, Panoche Valley, California by Geologica, June 1, 2010 IS 0.55. HydroCAD anaylsis performed by WHPacific shows approximately 15% can be expected during smaller 6-month frequency storms. Note that the pond is located proximally to the end of the incised channel. To be conservative a value of 0.05 is used.

Month	Runoff Volume (ac-ft)	Pan Evaporation Volume (ac-ft)	Exfiltration Volume (ac-ft)	Cumulative stored volume (ac-ft)	Estimated Stage (ft)	Estimated Surface Area at Stage (ac)	Volume at stage	Solver
September	0.012	0.003	0.008	0.000	0.06	0.003	0.0001	0.0000
October	0.340	0.050	0.221	0.069	1.65	0.084	0.0692	0.0000
November	0.880	0.049	0.509	0.391	3.91	0.200	0.3908	0.0000
December	1.408	0.030	0.527	0.392	3.92	0.200	0.3918	0.0000
January	1.936	0.029	0.527	0.392	3.92	0.200	0.3918	0.0000
February	1.866	0.048	0.476	0.392	3.92	0.200	0.3918	0.0000
March	1.244	0.096	0.527	0.392	3.92	0.200	0.3918	0.0000
April	0.622	0.140	0.499	0.375	3.83	0.196	0.3746	0.0000
May	0.158	0.125	0.290	0.118	2.15	0.110	0.1183	0.0000
June	0.000	0.038	0.073	0.008	0.56	0.029	0.0080	0.0000
July	0.000	0.003	0.005	0.000	0.04	0.002	0.0000	0.0000
August	0.000	0.000	0.001	0.000	0.00	0.000	0.0000	0.0000

Valadeo Site 4

Watershed Area=	0.3	mi^2				
=	192	acres				
Assumed fraction of rainfall that will reach pond[6]=	0.00273		Full Surface Area=	0.1 acres =	0.040 Ha	
Pond soil NRCS unit symbol=	YvB		Full Depth Estimate=	4.00 ft	Full Vol Estimate=	0.200 ac-ft
Projected pond infiltration rate=	1.7	in/hr	Area x coeff=	0.025		
Projected pond infiltration rate=	0.0425	in/hr	Volume x^2 coeff=	0.0125		

[6]Pond site is approximately 1000LF from incised channel, similar to existing. Used same proportionality as existing.

Month	Runoff Volume (ac-ft)	Pan Evaporation Volume (ac-ft)	Exfiltration Volume (ac-ft)	Cumulative stored volume (ac-ft)	Estimated Stage (ft)	Estimated Surface Area at Stage (ac)	Volume at stage	Solver
September	0.000	0.000	0.000	0.000	0.01	0.000	0.0000	0.0000
October	0.013	0.002	0.010	0.000	0.15	0.004	0.0003	0.0000
November	0.033	0.003	0.028	0.002	0.44	0.011	0.0024	0.0000
December	0.052	0.003	0.046	0.006	0.70	0.017	0.0061	0.0000
January	0.072	0.004	0.063	0.011	0.96	0.024	0.0115	0.0000
February	0.069	0.006	0.061	0.013	1.03	0.026	0.0133	0.0000
March	0.046	0.008	0.045	0.006	0.69	0.017	0.0059	0.0000
April	0.023	0.006	0.022	0.001	0.34	0.008	0.0014	0.0000
May	0.006	0.002	0.005	0.000	0.08	0.002	0.0001	0.0000
June	0.000	0.0002	0.0003	0.000	0.01	0.000	0.0000	0.0000
July	0.000	0.000	0.000	0.000	0.00	0.000	0.0000	0.0000
August	0.000	0.000	0.000	0.000	0.00	0.000	0.0000	0.0000

Silver Creek Ranch

Silver Creek Pond1

Watershed Area=	0.2	mi^2				
=	128	acres				
Assumed fraction of rainfall that will reach pond[4]=	0.005		Full Surface Area=	0.06 acres =	0.024 Ha	
Pond soil NRCS unit symbol=	PkA		Full Depth Estimate=	4.00 ft	Full Vol Estimate=	0.120 ac-ft
Projected pond infiltration rate=	1.74	in/hr	Area x coeff=	0.015		
Projected pond infiltration rate=	0.0435	in/hr	Volume x^2 coeff=	0.0075		

[4]Due to unknown specifics of the watershed, a conservative value that is roughly double that of the existing Valadeo Ranch pond was used.

Month	Runoff Volume (ac-ft)	Pan Evaporation Volume (ac-ft)	Exfiltration Volume (ac-ft)	Cumulative stored volume (ac-ft)	Estimated Stage (ft)	Estimated Surface Area at Stage (ac)	Volume at stage	Solver
September	0.001	0.000	0.000	0.000	0.01	0.000	0.0000	0.0000
October	0.015	0.003	0.012	0.001	0.30	0.004	0.0007	0.0000
November	0.040	0.003	0.032	0.005	0.83	0.012	0.0052	0.0000
December	0.064	0.003	0.053	0.013	1.32	0.020	0.0130	0.0000
January	0.088	0.004	0.073	0.024	1.80	0.027	0.0243	0.0000
February	0.085	0.007	0.072	0.029	1.98	0.030	0.0295	0.0000
March	0.057	0.011	0.059	0.016	1.47	0.022	0.0161	0.0000
April	0.028	0.009	0.031	0.005	0.79	0.012	0.0047	0.0000
May	0.007	0.003	0.008	0.000	0.20	0.003	0.0003	0.0000
June	0.000	0.0002	0.0004	0.000	0.01	0.000	0.0000	0.0000
July	0.000	0.000	0.000	0.000	0.00	0.000	0.0000	0.0000
August	0.000	0.000	0.000	0.000	0.00	0.000	0.0000	0.0000

Appendix H – Listed Vernal Pool Crustaceans Routine Monitoring Protocol for Preserved Areas